ROCK PRODUCTS

JULY ★ ★ 1946

THE INDUSTRY'S RECOGNIZED AUTHORITY

CEMENT · SAND & GRAVEL · GYPSUM
LIME · READY-MIXED CONCRETE · SLAG
CONCRETE PRODUCTS · CRUSHED-
STONE · INDUSTRIAL MINERALS

Flotation and Agglomerate Tabling Section, Peace Valley, Florida Phosphate Plant, International Minerals and Chemical Corp.

ONE "SLUGGER" .. does a "whale of a job"

SPEEDY REDUCTION at LOW COST . . .

The above open view clearly shows some of the outstanding "Slugger" features. Notice the heavy-duty manganese steel hammers, 1" thick liners and breaker plates, the powerful drive shaft, the dust-tight waterproof housings on two heavy-duty, self-aligning roller bearings. These and other features are reasons why you can rely on the "Slugger" to reduce more tonnages at low operating costs.

ONE Williams "Slugger" does such a thorough job that it eliminates the need for other primary or secondary crushers. It will reduce stone weighing up to 75 and 100 pounds to 1¼", ¾", or agricultural limestone *in one operation.*

"Sluggers" are built of the strongest materials and *by themselves* do a whale of a reduction job, whether the product desired is specification agstone or cubical-shaped aggregates free from slivers or elongated particles.

The "Slugger" Crusher and Pulverizer gives you not only speed, but also 100% efficiency and economy. Every producer, whether large or small, can profitably install a Williams Crusher. Write for information today.

THE WILLIAMS PATENT CRUSHER & PULVERIZER CO.

800 ST. LOUIS AVE. ST. LOUIS 6, MO.

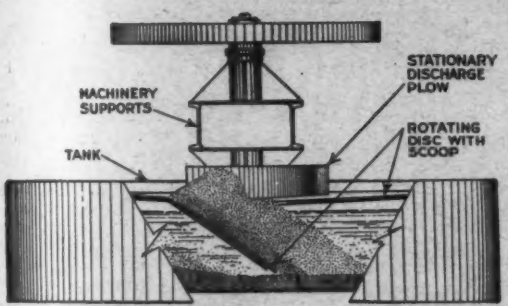
WILLIAMS FINE GRINDING EQUIPMENT WITH AIR SEPARATION

Write today for our Bulletin No. 621 on how to get faster, more efficient fine grinding of limestone, lime, coal, talc, etc. There is a Williams Roller Mill with Air Separator to fit your requirements. Finenesses from 100 to 400 mesh. We also build Impact Mills with Air Separation; Mechanical Air Separators for classifying finely ground material or taking the fines out of dry material.

Whitehead Bros. Co. sand-gravel plant at Dividing Creek, N. J. with Link-Belt conveyors, 3 Shaw Classifiers and a 12-ft. Rotoscoop (#4).

The LINK-BELT *Rotoscoop*

dewaters sand at low cost, while providing a means of wasting or saving the finer sizes, as desired



The illustrations above show the construction and operation of the Link-Belt Rotoscoop, an unusually efficient, flexible, compact dewatering unit for all types of sand. It recovers grain sizes usually lost in the overflow water, delivering sand dry enough for loading on conveyors.

With increasing demand for more precise grades of sand, it is important to produce at low operating and maintenance costs, and at a high rate of production, for maximum profit.

The Link-Belt Rotoscoop is a favorite in sand and gravel plants over the country for these reasons:

1. Unusually low head room, less construction required.
2. Slow speed of moving parts minimizes wear.
3. Extra squeezing and draining action assures better dewatering.
4. Action of Rotoscoop permits handling finer sizes than most dewatering devices.
5. Easy adjustments permit varying volume of fines to suit requirements.
6. Made in four sizes: 6′, 9′, 12′ and 15′ diameters, with capacities from 20 to 150 tons per hour.

We also make classifiers, conveyors and other sand and gravel handling, washing and sizing equipment; and design complete plants. Let us give you further information.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8.
Offices in Principal Cities. 10,407

LINK-BELT

SAND AND GRAVEL HANDLING AND PREPARATION EQUIPMENT

VOLUME 49 **ROCK PRODUCTS** NUMBER 7

JULY, 1946

This Month

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To Subscribers — Date on wrapper indicates issue with which your subscription expires...In writing to have address changed, give old as well as new address.

75 million smacks on its rubber face

A typical example of B. F. Goodrich development in rubber

THOSE pine logs are on their way to being paper. After the bark is removed, the logs — some 5 feet long and 2 feet across — are dumped onto that moving belt; edgewise, endwise, flat, any way they happen to tumble from the debarking drum. Standing and walking on the belt, workmen sort the logs, throwing out the bad ones, letting the good ones travel on to the pulp grinding room.

Steel conveyors are generally used in mills like this because the crashing logs would tear ordinary rubber and cotton belts to shreds in no time. But steel conveyors slow down the workmen—and production—and they're expensive to keep in shape. Looking for a better way to handle the logs when this mill was built, the manufacturer heard of a new kind of belt, developed and manufactured by B. F. Goodrich. Called a cord belt, it is made with each separate cord in each ply surrounded by rubber. Then, for good measure, an added ply with the cords running crosswise is placed on top. This permits the belt to stretch both ways and so absorb the crushing blows of logs — or rocks or lumps of coal.

The cord belt in the picture was installed, and in 6 years 75 million logs have poured onto it from the debarking drum. The belt is still in service and good for more millions of smacks on its rubber face.

The development of products like the cord belt — and thousands of others — by B. F. Goodrich show why your B. F. Goodrich distributor can almost always help you solve any problem involving the use of rubber — natural or synthetic. And if he can't, just write *Industrial Products Division, The B.F.Goodrich Company, Akron, Ohio.*

B.F.Goodrich
RUBBER *and* SYNTHETIC *products*

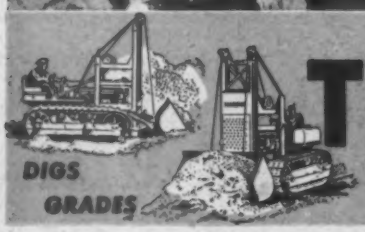
When You're Traxcavating, You're PROFIT-MAKING!

TRAXCAVATORS get things done! Put them to work digging, loading, carrying sand, gravel, rock, earth and other materials, and watch your hourly production climb — your operating costs fall. TRAXCAVATORS are seldom idle because these versatile, multi-purpose machines also maintain haulage roads, do clean-up work around the plant and in the pit, supply drawbar power and do countless other material-handling and earth-moving tasks.

TRAXCAVATORS are built in several sizes — for every job and purpose — with bucket capacities from ½ to 2½ cubic yards. Each is a balanced unit with the rugged "Caterpillar" track-type tractor by which it is powered. Learn now why it pays you to *traxcavate*—get the facts from your TRACKSON-"Caterpillar" dealer or write direct to TRACKSON COMPANY, Dept. RP-76, Milwaukee 1, Wisconsin.

Loading Pit Run Gravel

Loading Quarry Rock



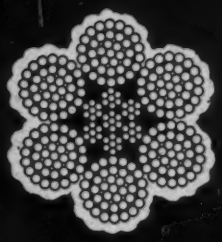
TRAXCAVATOR

REG. U. S. PAT. OFF.

THE ORIGINAL TRACTOR EXCAVATOR

DIGS GRADES LOADS CARRIES

For Strength plus Flexibility



UPSON-WALTON
6x37 LAYRITE WIRE ROPE

FOR overhead traveling cranes in steel mills, for winch lines and slings, for holding and closing lines on grab buckets, for towing hawsers and mining machine ropes—industry after industry has conditions where high strength must be combined with great flexibility.

Wherever drum or sheave diameters are small, or where reverse or acute bends are encountered, fatigue stresses are high. For this type of service Upson-Walton 6 x 37 Perfection Layrite Cable is best because the individual wires in the strand are finer; therefore they are more flexible and better able to resist fatigue stresses. In addition, the greater number of fine wires in the rope gives it a greater metallic area, so strength is still high.

Hemp center or, where crushing conditions are extremely severe, IWRC (independent wire rope center).

Specify Upson-Walton 6 x 37 when you need maximum flexibility plus a high degree of strength.

Specify Perfection grade because this improved plow steel is the strongest and toughest and most resistant to wear of all the grades of wire used to make rope.

Specify Layrite because this fine *pre*formed wire rope results in longer life, greater safety and greater economy.

Upson-Walton 6 x 37 Perfection Layrite is worth specifying, and always up to specifications!

Established 1871

THE UPSON-WALTON COMPANY

Manufacturers of Wire Rope, Wire Rope Fittings, Tackle Blocks

MAIN OFFICES AND FACTORY: CLEVELAND 13, OHIO

114 Broad Street, New York 4 — 737 W. Van Buren Street, Chicago 7 — 241 Oliver Building, Pittsburgh 22

Through Passenger Service Designed to Meet INDUSTRY'S NEEDS

Here is a new passenger train service ideal for industrial executives making business trips between the East and West Coasts. This no-extra-fare service is 10 to 18 hours faster than previous service between Chicago-St. Louis and the West Coast terminals.

Between NEW YORK-WASHINGTON, D. C. *and* LOS ANGELES-SAN FRANCISCO

• • • •

From New York . . . through sleeping-cars depart on the New York Central and the Pennsylvania railroads. On arrival at Chicago they are carried through to Los Angeles on the Transcon; to San Francisco on the Overland.

From Washington, D. C. . . . through sleeping-cars departing on the Pennsylvania are carried through from Chicago to Los Angeles on the Transcon—to San Francisco on the Pacific. Departing on the Baltimore and Ohio, sleeping-cars are carried through to San Francisco on the Pacific.

Similar service available eastbound from Los Angeles and San Francisco. No change of cars enroute in either direction.

Between ST. LOUIS-KANSAS CITY-DENVER *and* PACIFIC COAST

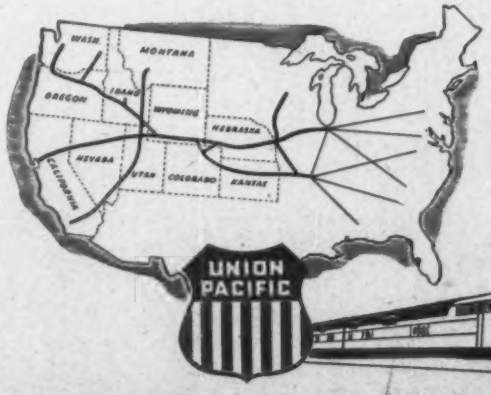
• • • •

Departing from St. Louis on the new Streamliner "CITY OF ST. LOUIS" through sleeping-cars are routed to Portland-San Francisco and Los Angeles (via Kansas City-Denver) with no change of cars enroute. Similar service is available eastbound from the West Coast.

• • • •

For complete information regarding schedules, accommodations and other passenger service to or from the Union Pacific West, inquire at your local ticket office.

TO VACATIONISTS . . . Union Pacific serves more western scenic regions than any other railroad. These include California, Pacific Northwest, Colorado, Yellowstone and the National Parks of Southern Utah-Arizona.

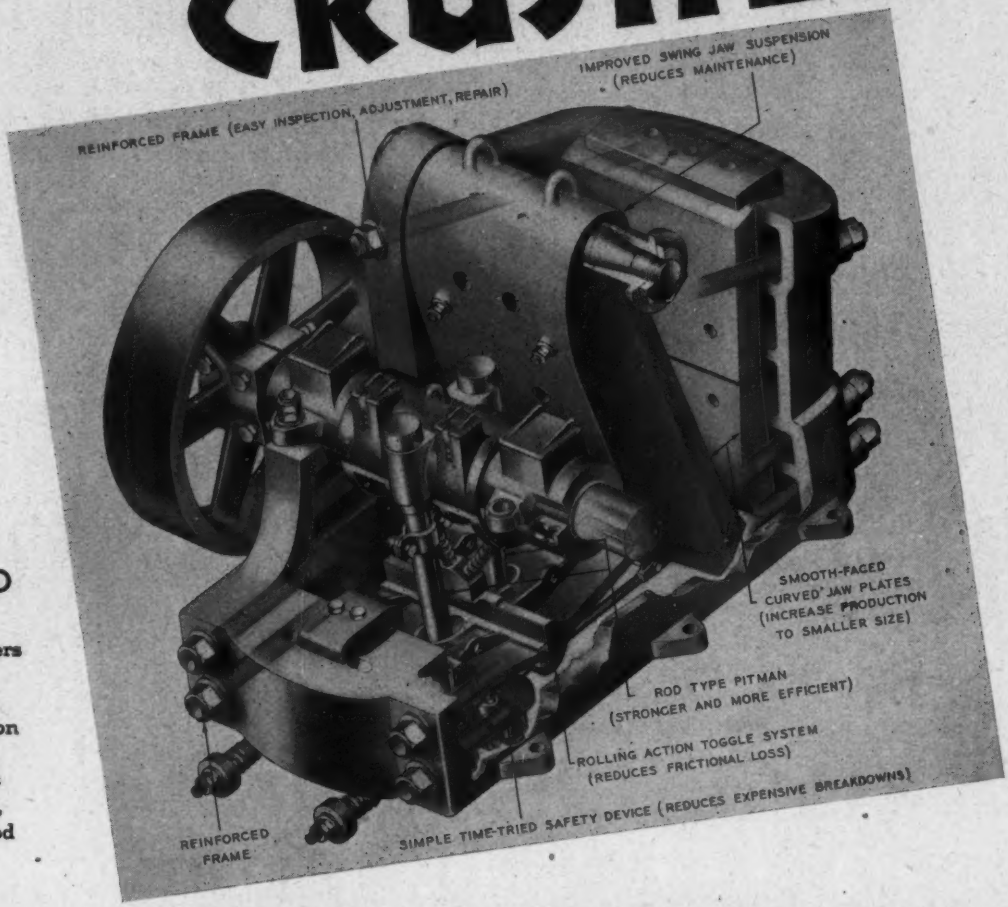


be Specific – say "Union Pacific"

UNION PACIFIC RAILROAD

ROAD OF THE Streamliners AND THE Challengers

IT'S A HUSKY CRUSHER



WE BUILD

- Rotary Kilns, Coolers, Dryers and Slakers
- Jaw, Gyratory and Reduction Crushers
- Crushing Rolls
- Grinding, Ball, Tube and Rod Mills
- Grizzleys and Feeders
- Classifiers
- Samplers and Jigs
- Furnaces
- Settlers
- Crucibles
- Forehearths
- Casting Machines
- Complete Crushing, Milling and Smelting Plants

The Traylor Type R Jaw Crusher is strongly built to stand up under round-the-clock duty, breaking the toughest kind of rock or ore. Built in 4 sizes from 36" x 42" to 48" x 60" it is designed for increased capacity at low operating and maintenance cost. It has six important features that make it one of the outstanding modern crushers.

Would you like to know more about the Type R Crusher and how it can profitably produce for you?

Our representative will be glad to call at your convenience—or write for Bulletin #123—it will be sent to you promptly.

TRAYLOR
ENGINEERING & MANUFACTURING CO.
MAIN OFFICE AND WORKS — ALLENTOWN, PENNA., U.S.A.

NEW YORK CITY
3416 Empire State Bldg.

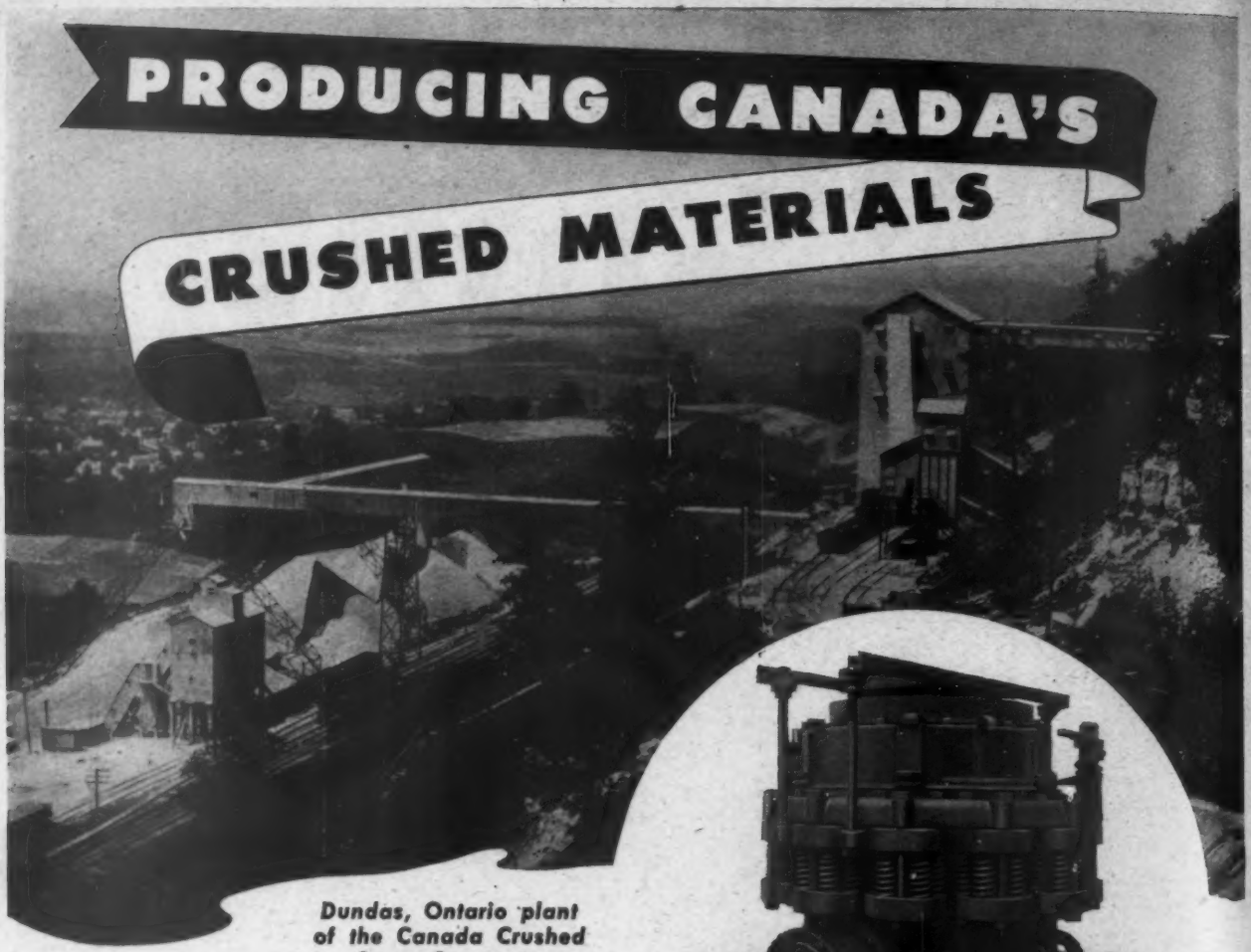
CHICAGO
2051 One La Salle St. Bldg.

LOS ANGELES
919 Chester Williams Bldg.

EXPORT DEPARTMENT
104 Pearl St., New York City

CANADIAN MFRS.—CANADIAN-VICKERS, LTD.
P.O. Box 550 Place D'Armes Station, Montreal, Canada

PRODUCING CANADA'S CRUSHED MATERIALS



Dundas, Ontario plant of the Canada Crushed Stone Company.

● Among the outstanding producers of crushed materials in Canada, Symons Cones are doing the reduction crushing just as they are in all localities where stone, gravel and slag are produced in quantity. At the various operations of the Canada Crushed Stone Company, three Symons Cones are in service; a 3 foot installed in 1928, a 5½ foot in 1929 and a 2 foot in 1942.

If you are making finely crushed materials, join the ranks of progressive producers who are doing the job profitably and satisfactorily with Symons Cones.

In addition to Symons Standard Cones for ordinary reduction crushing and Short Head Cones for extremely fine crushing, Nordberg also builds jaw and gyratory primary crushers in the medium and larger sizes.

NORDBERG MFG. CO.
MILWAUKEE 7, WISCONSIN

NEW YORK · LOS ANGELES · WASHINGTON · LONDON · TORONTO · JOHANNESBURG

SYMONS CONE CRUSHERS

ROCK WORK IS TOUGH

IT takes a bruiser to beat a bruising job. That's why Goodyear Hard Rock Lug tires are *first choice* wherever rock work's toughest. For these thick-tread haulers are brutes for punishment—built extra tough to take the murderous beating of every type of rock work. And years of standout service keep proving that these great Goodyears stand up longer, take it better, consistently deliver more pay loads at rock bottom costs. That's why it will pay to equip *your* rock-work units with Hard Rock Lugs—which today, for all practical purposes, are the equal of prewar tires in natural rubber content!

—and here are the reasons why:

MASSIVE LUG BARS armor the tread and sidewalls against cutting

SELF-CLEANING TREAD doesn't pack up, bites deeper, pulls better

EXTRA-THICK UNDERTREAD lengthens tire life—protects carcass from bruises

SUPERSTRONG CARCASS of Goodyear's patented Rayotwist Cord—made from rayon—adds more stamina, long life

MULTIPLE BEADS of high-tensile steel wire insure non-slip anchorage to rim

BUY and SPECIFY GOODYEAR —it pays!

Rayotwist—T. M. The Goodyear Tire & Rubber Company

GOODYEAR

MORE YARDS ARE MOVED ON GOODYEAR OFF-THE-ROAD TIRES THAN ON ANY OTHER KIND

"MISSISSIPPI WAGONS GIVE US

The Cheapest Yard

Mississippi Wagons loading, hauling and dumping on the Mississippi River levee operations of T. H. Stout Construction Company

HEMMING in Ol' Man River is a tough, never-ending job that goes on in all seasons and weather. Levee construction calls for tough, never-quitting hauling equipment... if work is to go forward on schedule and at a profit.

The ability of Mississippi Wagons to keep going in rough going is well known along the levees. But the full degree of their freedom from expensive repairs, and consequent ability to haul at rock-bottom costs-per-yard, is best revealed by the cost records of owners—such as the T. H. Stout Construction Company, of Cleveland, Miss.

"Worst Conditions in 25 Years"

The T. H. Stout Construction Company purchased seven Mississippi Wagons in September, 1944, to handle contracts for levee work at points south of Greenville, Miss.

After encountering normal conditions during the first construction season, the company resumed work in June, 1945, in ground still waterlogged from floods. Heavy intermittent rains kept the ground from drying out during the entire remainder of the year. "Operating conditions," says T. H. Stout, owner of the company, "were the worst that have been known along the Mississippi River in any construction season in the last 25 years.'"

In 15 months, nevertheless, the seven Mississippi Wagons hauled a total of 724,000 yards of earth to the levee, for an average of 103,428 yards per unit. Some of the dirt was carried from considerable distances, and much of it was hauled to the top of the embankment, as the company's contracts included heightening the levee by five feet.

1 1/6¢ Per Yard For Repair Parts

During these 15 months the Stout company used a total of $8,421.56 worth of repair parts on its Mississippi Wagons — an average of $1,203.08* per unit. Figured on a yardage

*Broken down as follows: Motor, $277.95; fuel pump, $79.96; master clutch, $32.64; transmission, $282.35; rear end, $206.66; miscellaneous, $126.66; trailer, $198.86.

For further information on Mississippi Wagons, consult your nearest distributor or write direct.

M-R-S MANUFACTURING COMPANY
JACKSON, MISSISSIPPI, U. S. A.

Yardage We've Ever Hauled!"

—T. H. STOUT, Mississippi Levee Contractor

basis, the repair parts cost came to just one and one-sixth cents per yard of dirt hauled.

"For Mississippi River levee operations, and particularly under last season's conditions, this is an almost unbelievably low figure," declares Mr. Stout. "And it would undoubtedly have been even lower, had we not been forced to use our head mechanic as job superintendent, making it impossible for him to properly supervise the maintenance of our equipment."

Easy, Efficient Operation

"In addition to the low maintenance cost of our Mississippi Wagons," says Mr. Stout, "we are highly pleased with their ease of operation, operator comfort, superior flotation on soft ground, accessibility for making repairs, and short turning radius.

"With their all-round operating economy, I am convinced that Mississippi Wagons give us the cheapest yardage we've ever hauled. And I am also convinced that any hauling equipment that could operate successfully and economically for us during the past season, can do likewise on any construction job anywhere!"

Only MISSISSIPPI WAGONS Give You Both These Important Advantages:

1. FOUR-AXLE CONSTRUCTION

- Puts more tire surface on the ground, providing maximum flotation over soft earth on construction work.
- Enables you to haul payloads of up to 27,000 pounds on highways without exceeding state axle-loading limits.
- Relieves the tractor of all trailer weight (except when needed for traction), thus prolonging tractor life and cutting repairs to a minimum.

2. HYDRAULIC WEIGHT TRANSFER

The simple hydraulic cylinder transfers weight from trailer to tractor when extra traction is needed. This patented feature is found exclusively on Mississippi Wagons. It makes possible their four-axle design, which gives you both construction and over-the-highway equipment in a single unit . . . for a single investment.

★ MISSISSIPPI WAGON

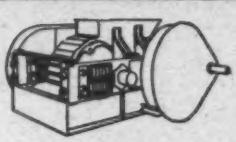
★ The World's Most Modern Hauling Unit

Get Better Engineered Field Proved Crushing Equipment

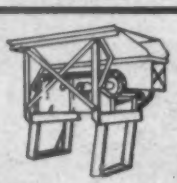
COMPLETE PLANTS

AUXILIARY EQUIPMENT

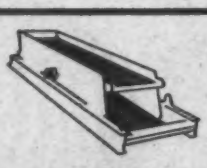
JAW CRUSHER



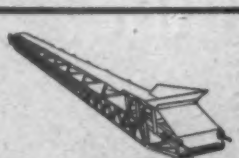
ROLL CRUSHER



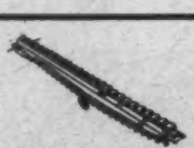
APRON FEEDER



GYRATING SCREEN



"Lattice" Conveyor



Bucket Elevator

BASIC UNITS OR COMPLETE PLANTS

Whether you need a complete crushing plant or just a crusher, screen, feeder, conveyor, or bin, it will pay you to get all the information about Universal better engineered, field-proved, cost-cutting equipment before you place your order. For nearly half a century Universal has led the industry in designing and building high production equipment that turns out more tons of material at lower costs and stays on the job, year-in and year-out.

Shown at left are two Universal portable plants that have made outstanding records all over the country. The 880 Gravelmaster, a single unit, dual crusher plant that combines easy portability with high production and has the in-built stamina that keeps maintenance costs down. The 822-Q, a dual unit rock plant, designed for low cost quantity production of aggregate. Superior Universal engineering and precision gives you these plants ready to go to work without the need for changes on the job. They're only two of the dozens of field-proved Universal rock and gravel plants.

Universal Engineering Corp.
617 C Avenue West, Cedar Rapids, Iowa

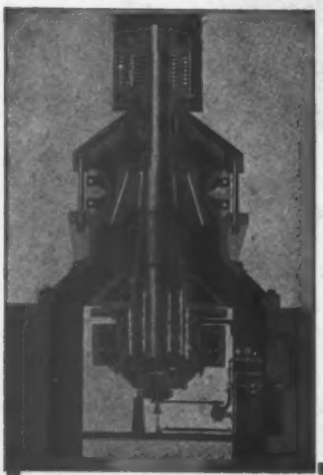
FOR FORTY YEARS
UNIVERSAL
ROCK AND GRAVEL CRUSHING AND SCREENING PLANTS

LET KENNEDY ENGINEERING MAXIMUM PRODUCTION FOR

Where modern Rock Products plants are setting new production and economy records, you'll find KVS precision-engineered, precision-built equipment on the job.

Kennedy-Van Saun are complete outfitters for sand and gravel, crushed stone, lime and cement producers.

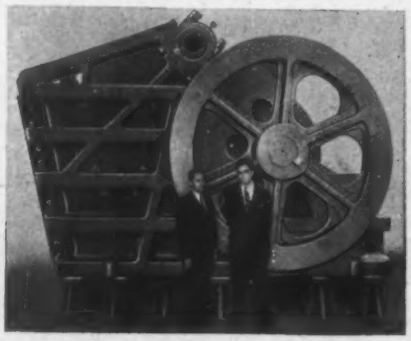
KVS engineers are ready to advise you on your refitting and expansion problems. Representatives in principal cities in the United States and foreign countries including Ejido 7-503, Mexico, D. F.



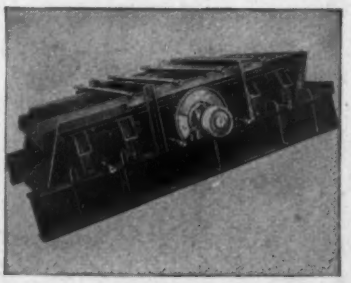
KVS BALL-BEARING GEARLESS CRUSHER saves 80% on maintenance and 50% in power over geared crushers. No power is wasted on gears since the motor is built directly into the pulley assembly.

Reversible grinding rings give double wear to wearing surfaces. Forced feed lubrication means long life for working parts. Easy accessibility, quick adjustment of crusher opening cut down standby time.

ASK ABOUT THE FAMOUS MODEL No. 49½



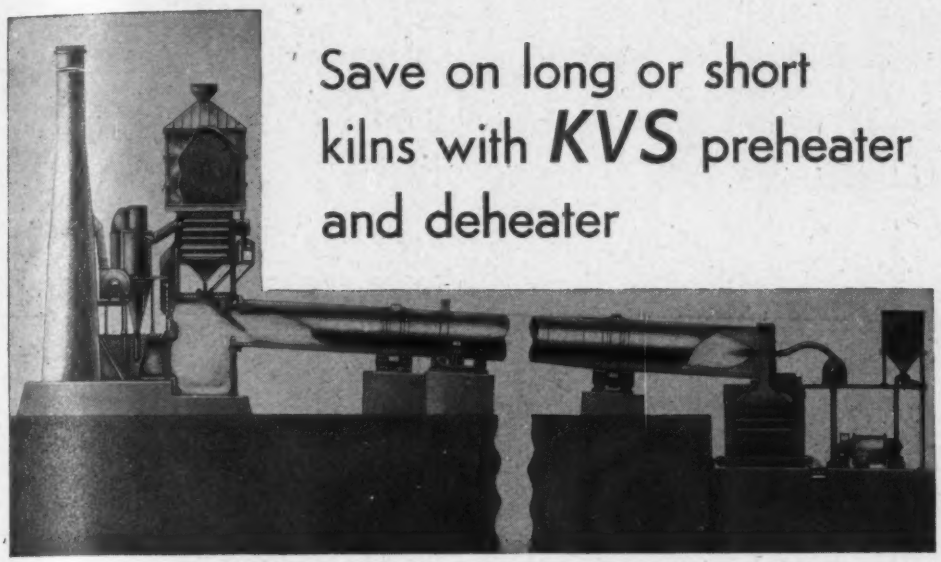
KVS SWING JAW CRUSHERS are the extra heavy duty type for handling large tonnages of toughest rocks. Available in sizes to meet all output and feed requirements.



KVS VIBRATING SCREENS give 95% sizing efficiency. Low installation and maintenance costs. Available in three types and many sizes.

KENNEDY-VAN SAUN MFG. & ENG. CORPORATION

AND EQUIPMENT GIVE YOU THE POST-WAR MARKET . . .



Save on long or short kilns with *KVS* preheater and deheater

KVS PREHEATER AND SOAKING PIT can be attached to your present long or short lime kiln. You can increase production and fuel efficiency of your present kiln the KVS way.

Using the preheater, soaking pit and deheater, we are making high grade lime in short kilns with less than 5,600,000 BTU's per ton of lime. Fuel savings average 40%.

KVS MACHINERY

KILNS	CONVEYORS
COOLERS	ELEVATORS
DRYERS	GRINDING MILLS
CRUSHERS	CLASSIFIERS
HAMMERMILLS	WASHERS
SCREENS	DUST COLLECTORS
FEEDERS	AIR SEPARATORS

Complete Cement, Rock Crushing, Sand and Gravel, Lime and Dolomite Plants.

WRITE TODAY FOR OUR CATALOG and description on these and other types of KENNEDY machinery.

2 PARK AVENUE • NEW YORK 16, N. Y. FACTORY: DANVILLE, PA.

There are two practical ways to handle bulk cement . . .

Fuller-Kinyon Remote-Control Unloader unloading cement from box car.

Fuller-Kinyon Stationary Pump installed in pit underneath tracks for unloading cement from hopper-bottom cars.

and both are FULLER-KINYON

The old saying, "There are no two ways about it," doesn't hold good when applied to the unloading and conveying of bulk Portland cement. Because there are two practical ways to do the job, and they're both Fuller-Kinyon. Both systems are efficient and economical of operation; do a quick, clean job of unloading and conveying from box and hopper-bottom cars.

Fuller-Kinyon Remote-Control Unloader—for unloading from box cars, ships and barges. Now used by many ready-mix concrete and asphalt plants, and contractors on highway and dam construction. Any ordinary laborer can operate this equipment with the greatest of ease. Built in different types and sizes for various capacities.

Fuller-Kinyon Stationary Pump—for unloading from hopper-bottom cars. The pump is installed in a pit underneath the tracks. Connection between car and pump is quickly and easily made without dust or loss of material. Built for various capacities to 300 tons per hour.

FULLER COMPANY

CATASAUQUA, PENNSYLVANIA

Chicago 3 - 120 So. LaSalle St.
San Francisco 4 - 421 Chancery Bldg.
Washington 5, D. C. - 618 Colorado Bldg.

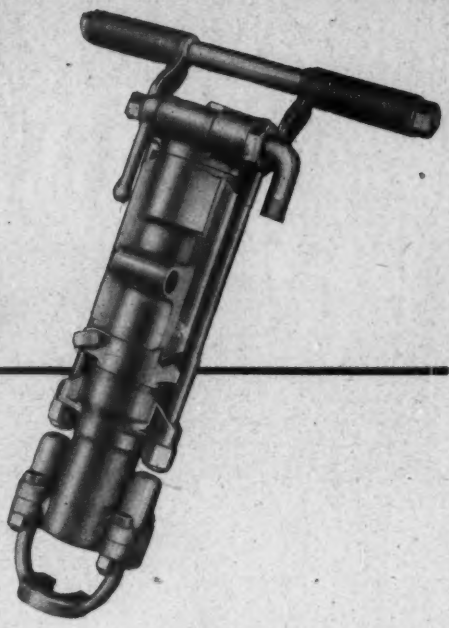
FULLER COMPANY

FULLER-KINYON, FULLER-FLUXO AND THE AIRVEYOR CONVEYING SYSTEMS . . . ROTARY FEEDERS AND DISCHARGE GATES . . . ROTARY AIR COMPRESSORS AND VACUUM PUMPS . . . AIR-QUENCHING INCLINED-GRATE COOLERS . . . DRY PULVERIZED-MATERIAL COOLER . . . AERATION UNITS . . . MATERIAL-LEVEL INDICATORS . . . MOTION SAFETY SWITCH . . . SLURRY VALVES . . . SAMPLERS

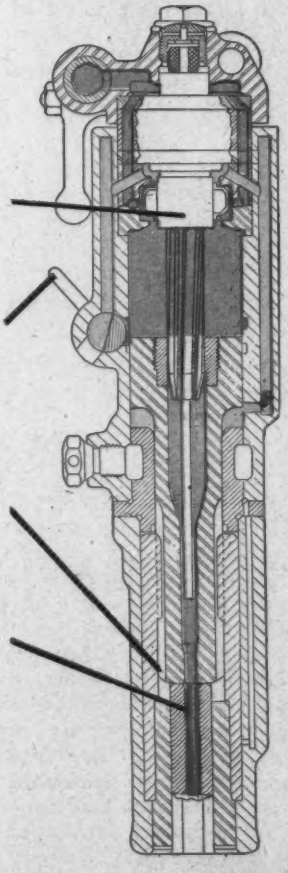
P-78

WHY LEADING MINING MEN SPECIFY

Thor ROCK DRILLS



DETAIL DRAWING SHOWS Thor SINKER ROCK DRILL IN "BLOWING" ACTION



The FOREMAN knows Thor's "Straight-line" design provides extra blowing power to keep the hole clean and speed drilling

Exceptional Hole Cleaning ability is a major reason why Thor Sinker Rock Drills perform at peak efficiency to give more footage per shift. "Straight-line" design, as shown at the left, puts compressed air at *full pressure* directly through the center of the steel to the drilling face. This heavy blast—controlled by the drill runner—blows the hole clean and adds to the penetration rate. This efficient blowing prevents "stuck steels."

This same efficient use of air power, automatically controlled through Thor's short-travel, tubular valve, provides powerful rotation and harder piston-hammer blows that result in superior drilling speed. Prove this yourself on your own work. Your nearby Thor distributor will be glad to arrange a demonstration.

INDEPENDENT PNEUMATIC TOOL COMPANY
600 West Jackson Boulevard, Chicago 6, Illinois

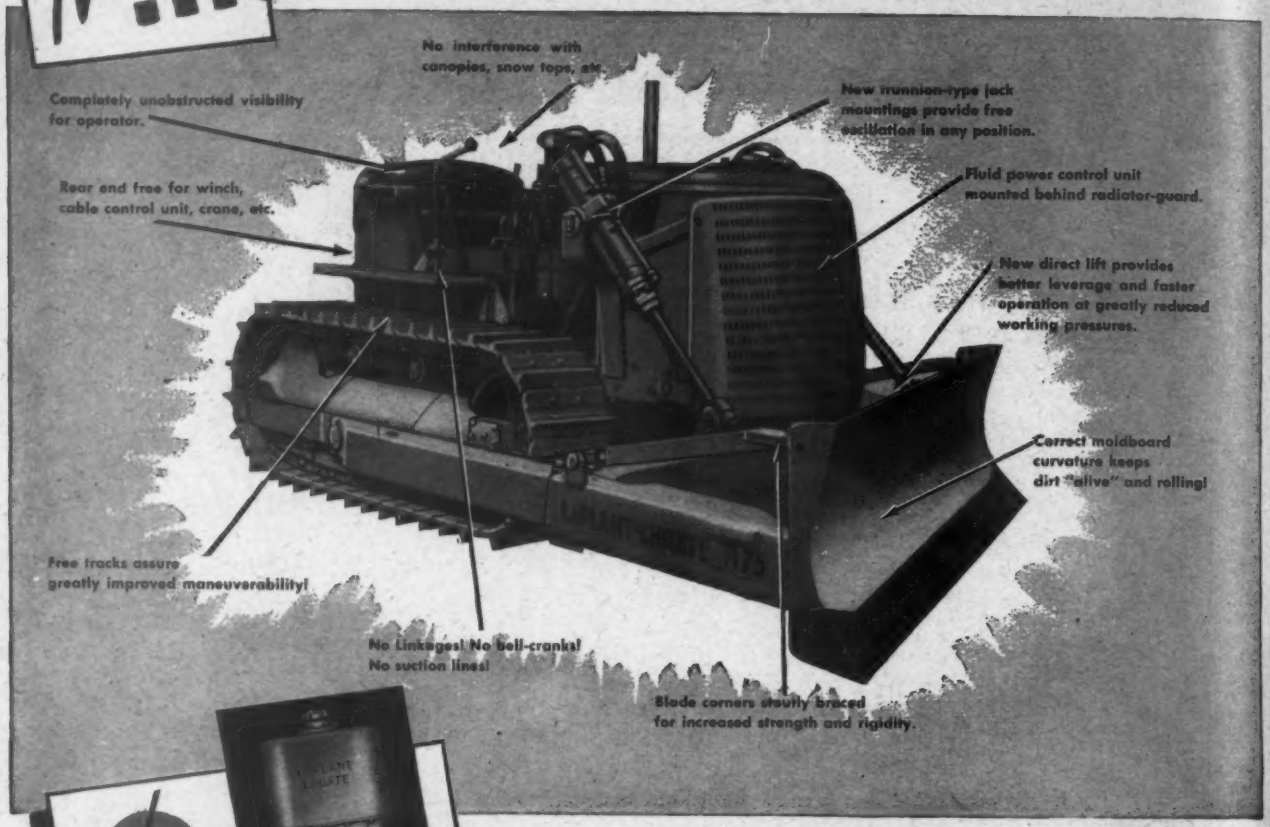
Birmingham Boston Buffalo Cleveland Detroit Los Angeles Milwaukee New York Philadelphia
Pittsburgh St. Louis Salt Lake City San Francisco Toronto, Canada London, England

Thor PORTABLE POWER TOOLS

PNEUMATIC TOOLS • UNIVERSAL AND HIGH FREQUENCY ELECTRIC TOOLS • MINING AND CONTRACTORS TOOLS

NOW! ...a hydraulic dozer

...all the speed and simplicity of a cable machine!



PLUS

LaPLANT-CHOATE'S FAMOUS

"fluid power control"

Pump, valve and oil reservoir are all combined into a single compact unit that mounts on the front of the tractor behind the radiator guard. This new "closed system" design completely eliminates long suction lines, reduces the hazard of leaks and assures greatly increased speed and efficiency. In addition, the entire unit is skillfully engineered and precision built for utmost simplicity, easy servicing, and long, trouble-free operation at lowest possible cost.

Here at last is a dozer that gives you all the advantages of hydraulic operation—powerful "down pressure" and positive blade control — *plus* new dependability, simplicity and fast blade action that will compare favorably with any cable dozer you've ever used. Developed for war and thoroughly proved under tough combat conditions, this new LaPlant-Choate machine has already been hailed as the greatest dozer advancement in over a decade. Moreover, it can be obtained with either straight or angling blade for "Caterpillar" D-8 and D-7 tractors, while other LaPlant-Choate hydraulic models are available for the smaller D-6, D-4 and D-2 sizes. See your LaPlant-Choate distributor today for complete details. LaPlant-Choate Manufacturing Co., Inc., Cedar Rapids, Iowa; San Leandro, Calif.

LaPLANT-CHOATE

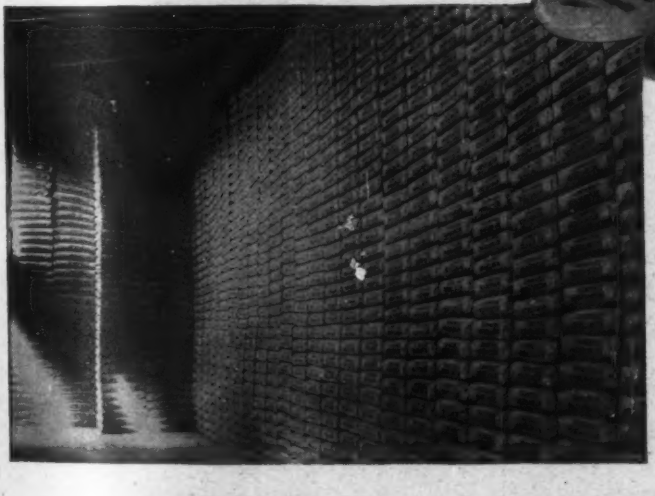
Job-Proved Equipment... for Lowest Possible Cost in Moving Earth

HOW Multiwall Paper Bags SERVE LIME AND LIMESTONE PRODUCERS

205-FL two-tube Packer; also made with three tubes.

TODAY, lime for the agricultural, chemical and construction industries can be shipped in more completely hydrated form and in much finer particles because of the work done by St. Regis engineers in conjunction with leaders in the lime and limestone field.

Dating back to 1908, when the Valve Bag Company (now part of the St. Regis organization) offered the first mechanized packer to the lime and limestone industries, carrying through the early 1930's, when the multiwall bag was generally adopted as the standard package and extending through improvements in paper- and bag-making to the present day, St. Regis is proud of the part it has played in the growth of these industries.



Further developments, such as the use of moisture-proof sheets, extended valves and inserts, are further cementing the relationship between the multiwall bag industry and the producers of lime and limestone . . . as demonstrated by their use of more than 150 million multiwall bags in 1945.

St. Regis MULTIWALL PAPER BAGS

MULTIPLY PROTECTION • MULTIPLY SALEABILITY

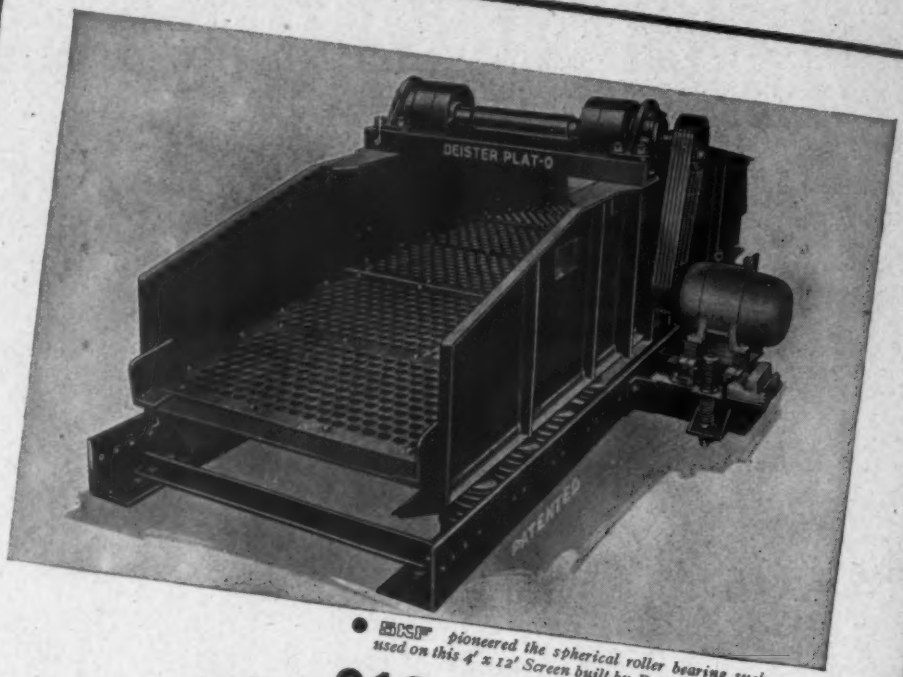
ST. REGIS SALES CORPORATION

(Sales Subsidiary of St. Regis Paper Company)

NEW YORK 17: 230 Park Ave. CHICAGO 1: 230 No. Michigan Ave.
BALTIMORE 2: 2601 O'Sullivan Bldg. SAN FRANCISCO 4: 1 Montgomery St.

IN CANADA:
St. Regis Paper Co. (Can.) Ltd.
Vancouver, British Columbia
Montreal, Quebec

Birmingham Boston Cleveland Dallas Denver Detroit Franklin, Va. Los Angeles
Nazareth, Pa. New Orleans No. Kansas City, Mo. Ocala, Fla. Oswego, N. Y. Seattle Toledo



● SKF pioneered the spherical roller bearing such as used on this 4' x 12' Screen built by Deister Machine Co.

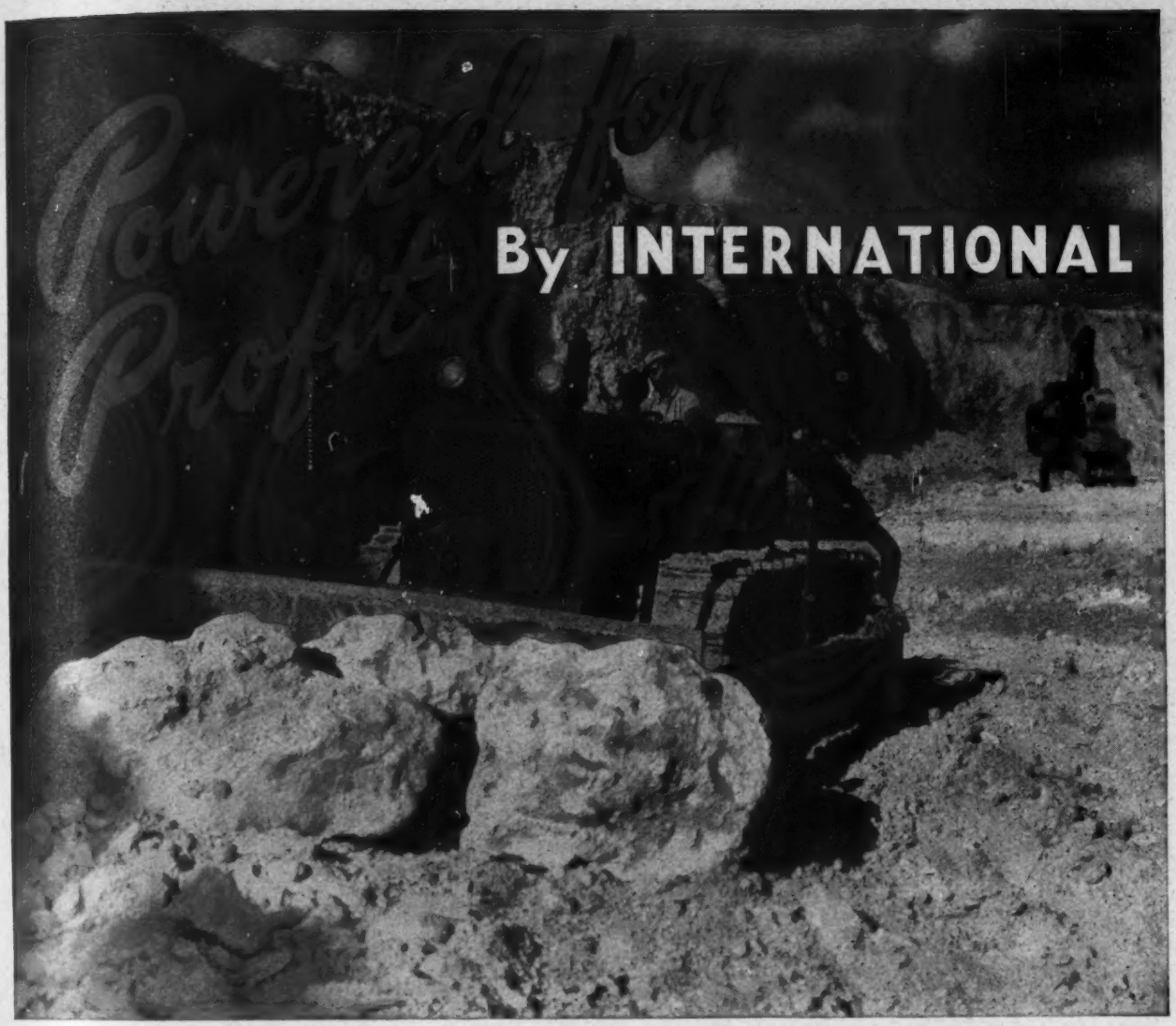
under 312 TPH capacities for years

SKF Spherical Roller Bearings have been used since the first of these 4′ x 12′ Deister PLAT-O Scalper Screens went to work in a crushed stone plant in 1932. That screen was intended for sizing 9″ x 0″ crushed rock at the rate of about 300 tons per hour, but the operators wired that the screen, appearing to be only half-loaded, handled 312 tons an hour. For SKF Bearings to stand up for years under such capacities speaks well for their rolling alignment, high load carrying capacity and many other outstanding advantages. If you build or use machines that tackle tough jobs, ask an SKF engineer to help you select the right bearing for the right place.

6069

SKF INDUSTRIES, INC.
Front St. & Erie Ave., Phila. 34, Pa.

SKF
Puts the
RIGHT BEARING
in the
RIGHT PLACE



PROFITS from your pit or quarry depend largely on efficient power. This limestone quarry, producing up to 2500 tons of crushed limestone a day, depends on four International Crawlers—mobile power plants—to clear land, remove overburden, stockpile materials and do a variety of other jobs.

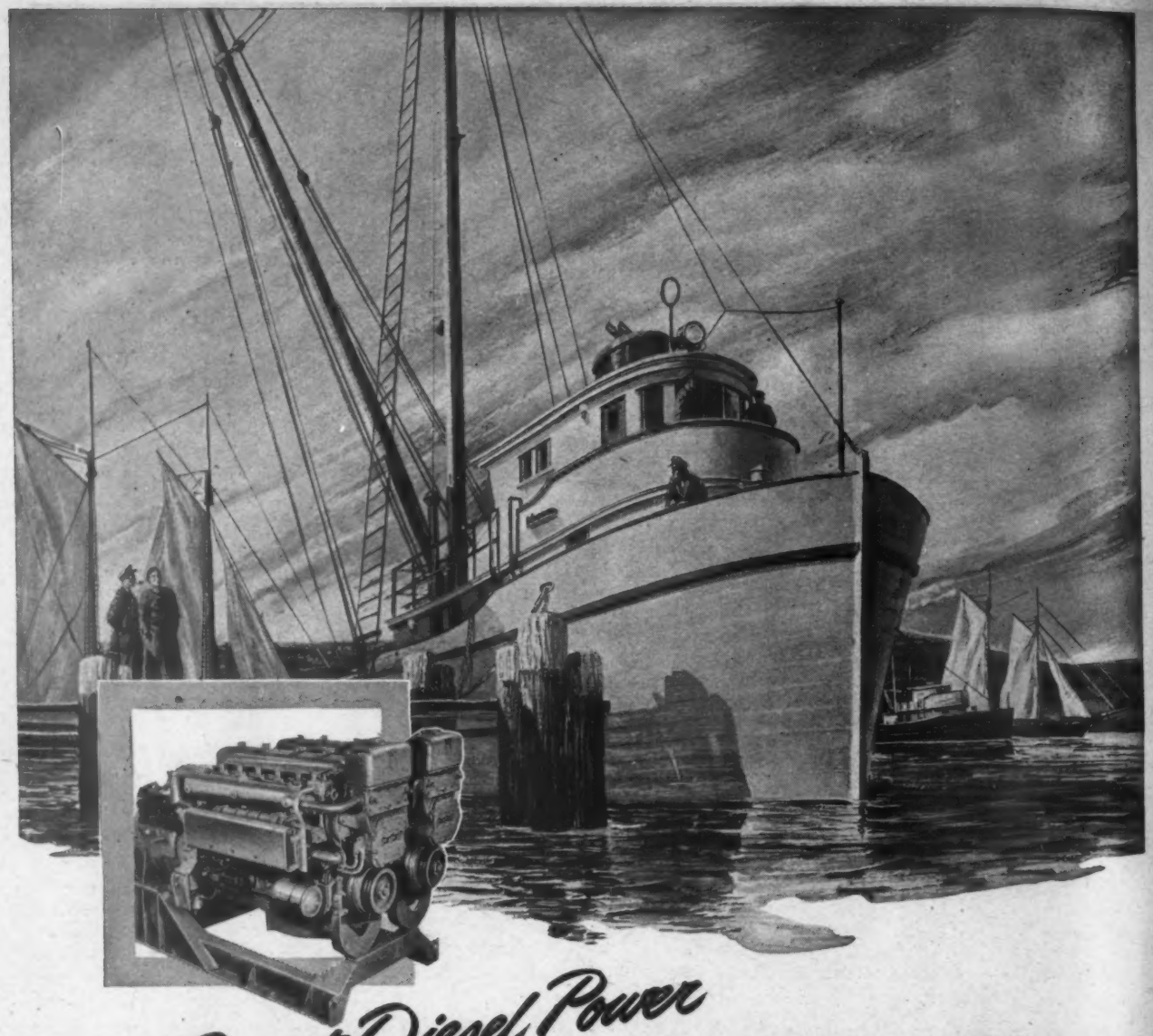
International TracTracTors are durable but not clumsy. Modern materials and design have reduced unproductive weight. Because they're better balanced, Internationals are literally *geared to the ground* for maximum traction.

They're dynamic but not costly to operate. Precision-built, International *full-Diesel* engines are miserly with fuel but deliver *full-rated* horsepower to the drawbar where horsepower counts. These facts are reasons why Internationals will power your quarry for profit.

A visit to your International Industrial Power distributor will furnish you with the facts about profit-making power—International Power. It will be to your advantage to make that visit soon.

Industrial Power Division
INTERNATIONAL HARVESTER COMPANY
180 North Michigan Avenue Chicago 1, Illinois

INTERNATIONAL INTERNATIONAL HARVESTER Industrial Power



For Great Diesel Power —set your course by the fisherman

FISHERMEN make their money by getting back fast with the most fish and at the least cost. There's no profit in hauling around big, heavy engines that take up a lot of room.

So every day sees more and more General Motors Diesels going into fishing boats. And for good sound reasons.

These Diesels pack more power in less space—weigh less than older types. *So GM-powered boats carry more fish.*

GM Diesels get efficient combustion from low-cost fuel—keep going day after day with the least maintenance.

Add these features to the reduced fire hazard, easy starting, quick availability of parts and service, and you see that GM Diesels have features that are valuable everywhere power is needed. That is why they're taking over so many jobs that Diesels never handled before.

Whatever needs for power you may have in road-making machinery, cranes, shovels or any other construction equipment—look to GM Diesels.

GM
GENERAL MOTORS
DIESEL POWER

Features of GM Diesels Important to Every User of Power

- ***QUICK TO START*** on their own fuel
- ***LOW COST***—run on common fuel oil
- ***EASY TO MAINTAIN***—clean design plus accessibility
- ***LESS FIRE HAZARD***—no volatile explosive fuel
- ***COMPACT***—readily adaptable to any installation
- ***SMOOTH OPERATION***—rotating and reciprocating forces completely balanced
- ***QUICK ACCELERATION***—2-cycle principle produces power with every downward piston stroke

DETROIT DIESEL ENGINE DIVISION
DETROIT 23, MICH. • SINGLE ENGINES . . Up to 200 H.P. MULTIPLE UNITS . . Up to 800 H.P.
GENERAL MOTORS

ROCK or GRAVEL

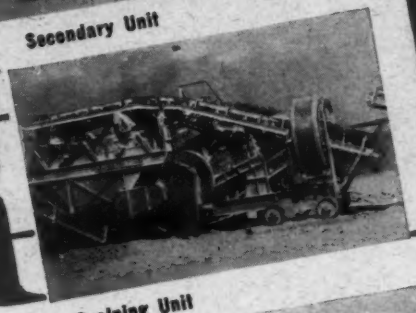
crushed . . . sized . . . washed

to fit any specification from rip rap stone to agstone

Cedarapids UNITIZED PLANT

Primary Crusher Unit—with Feeder

Secondary Unit



Scalping Unit

Washing & Sizing Unit

For crushed stone when medium sized stone has to be reduced to 1½" — and a certain size is to be scalped out. Use Units 2 and 3.

For crushed gravel. Use Unit 3 alone.

For washed gravel. Use Units 3 and 4.

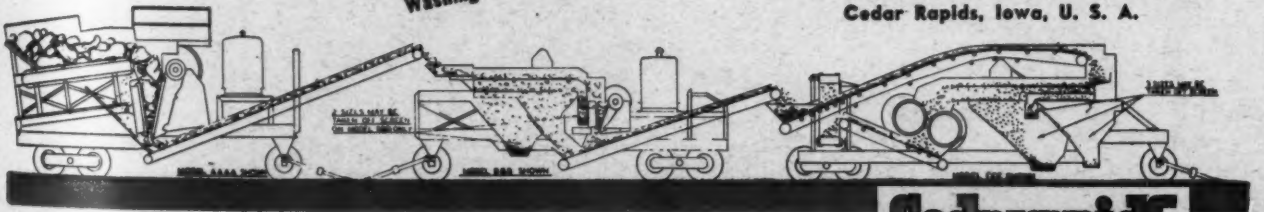
For crushed stone when big stone has to be reduced to 4½" — and a certain size is to be scalped out. Use Units 1, 2 and 3.

For crushed stone when finer sizes are required — 25" rock down to 1½". Use Units 1 and 3.

Complete Crushing, Screening and Washing Plant. Use Units 1, 2, 3 and 4.

Each element of the Cedarapids Unitized Plant is a complete unit in itself balanced for high capacity and low cost, used alone or in any one of dozens of different combinations of matched units. You can start with a tandem single-flightline secondary plant and produce washed gravel and add the other units as your demands increase. You can use a roll crusher, cone crusher, twin jaw crusher or hammermill in the Secondary Unit. Each unit is portable so you can move just the equipment needed to do any particular job. Get the complete story from your nearest Cedarapids distributor. There's a size and type to fit every production requirement both as to volume and finished products. When buying a crushing plant—buy the best—buy Cedarapids.

Iowa Manufacturing Company
Cedar Rapids, Iowa, U. S. A.



Cedarapids

Built by IOWA

THE IOWA LINE *of Material Handling Equipment Includes:*

ROCK AND GRAVEL CRUSHERS
BELT CONVEYORS—STEEL BINS
BUCKET ELEVATORS
VIBRATOR AND REVOLVING SCREENS

STRAIGHT LINE ROCK AND GRAVEL PLANTS
FEEDERS—TRAPS
PORTABLE POWER CONVEYORS
KUBIT IMPACT BREAKERS

TRAVELING (ROAD MIX) PLANTS
DRAG SCRAPER TANKS
WASHING PLANTS
TRACTOR-CRUSHER PLANTS
STEEL TRUCKS AND TRAILERS

PORTABLE STONE PLANTS
PORTABLE GRAVEL PLANTS
REDUCTION CRUSHERS
BATCH TYPE ASPHALT PLANTS

Diesel Engine DANGER points

Alloy bearings corroded by unstable lubricants

The high pressures and temperatures in present-day Diesel engines greatly accelerate oxidation of some lubricants. Under such conditions, these oils tend to become corrosive and attack the lead in the copper-lead structure of alloy bearings. This leaves a porous copper shell which breaks down under pressure. The illustration shows how an alloy bearing looks after operation with an uncompounded oil.

RPM DELO Oil gives bearings 3-way protection against corrosion

1. RPM DELO Diesel Engine Lubricating Oil base stocks are naturally resistant to oxidation, the cause of most lubricants becoming corrosive.
2. RPM DELO Oil is *compounded* to further reduce the danger of oxidation.
3. RPM DELO Oil's oxidation inhibitor gives bearings direct protection against corrosion.

In addition, RPM DELO Oil is compounded to prevent ring-sticking, to reduce wear by clinging to high-temperature areas most oils leave bare, to eliminate foaming.

To match the fine performance of RPM DELO OIL, use these equally efficient companion products from the same famous "RPM" line—RPM HEAVY DUTY MOTOR OIL —RPM COMPOUNDED MOTOR OIL—RPM GEAR OILS AND LUBRICANTS—RPM GREASES. For additional information or name of your distributor, write any of the companies below:

STANDARD OF CALIFORNIA • 225 Bush St., San Francisco 20, California
THE CALIFORNIA COMPANY • 17th and Stout Streets, Denver 1, Colorado
STANDARD OIL COMPANY OF TEXAS • El Paso, Texas
THE CALIFORNIA OIL COMPANY • 30 Rockefeller Plaza, New York 20

DIESEL ENGINE RPM DELO LUBRICATING OIL

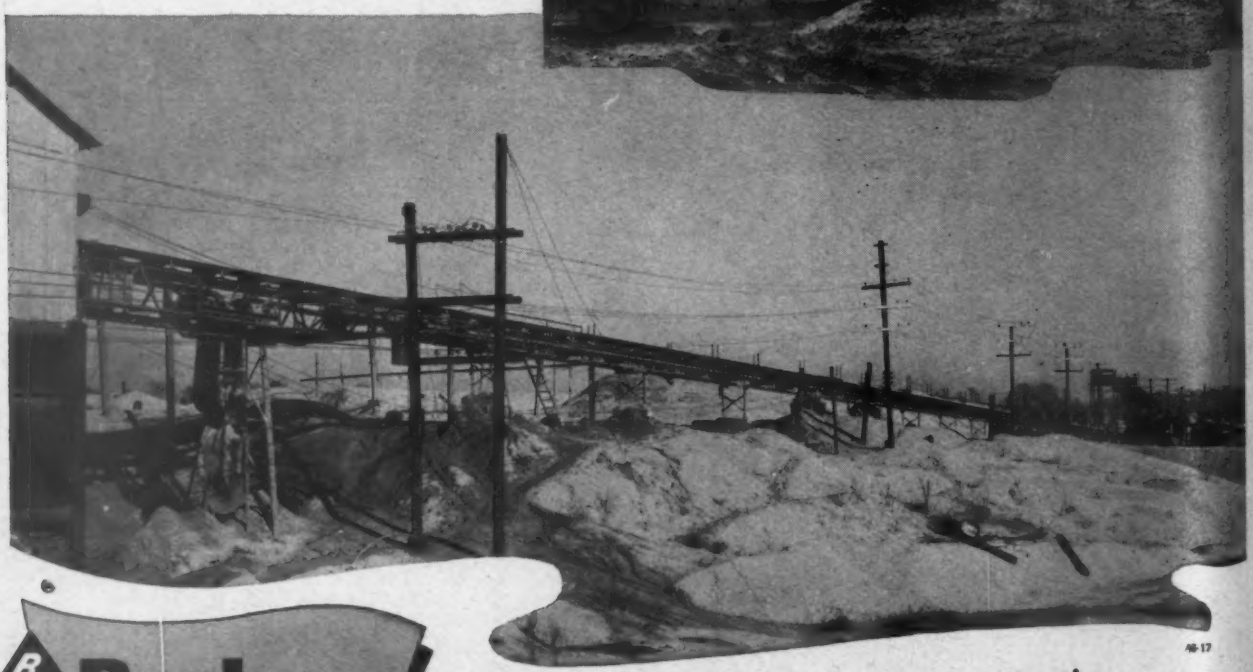
Why changes in Conveyor set-ups are made faster through

BG Standardization

• Setting up, moving, lengthening or shortening a Barber-Greene Conveyor system is greatly facilitated through pre-fabrication and pre-engineering of all units at the factory. In setting up a Barber-Greene Conveyor system, all important units such as drive-ends, take-up ends, carriers, etc., arrive on the job already assembled. Erection is a matter of bolting these units together.

In addition, factory-assembly of these terminal units assures correct assembly. There is no collection of pulleys, bearings, shafts, and gears to fit together. Because they are pre-fabricated units, correct alignment in the erected conveyor is assured, prolonging belt life and insuring minimum maintenance requirements.

Write for the Barber-Greene Belt conveyor Catalog No. 76. Barber-Greene Company, Aurora, Illinois.

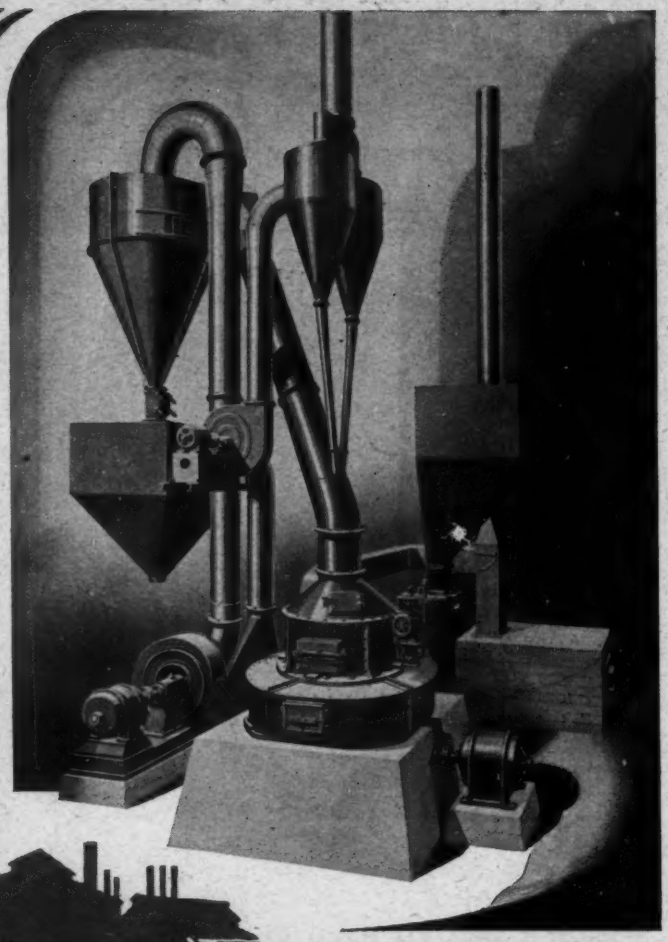


AB-17

BG Barber-Greene CONSTANT FLOW EQUIPMENT

LOADERS • PERMANENT CONVEYORS • DITCHERS • PORTABLE CONVEYORS • FINISHERS • BITUMINOUS PLANTS • COAL MACHINES

RAYMOND
SUPER MILLS
for High
PRODUCTIVITY
UNIFORMITY
ECONOMY



TYPICAL PRODUCTS HANDLED BY RAYMOND SUPER ROLLER MILLS

Drying and Grinding Limestone

Pulverizing Burned Dolomite

Grinding Kaolin and Clays

Reducing Florida Pebble Rock and Concentrates

Pulverizing Raw Gypsum Rock and Removing Moisture

Grinding Idaho Phosphate Rock and Reducing Moisture from 6% down to 1% final content.

IN these days of huge capacities, SUPER ROLLER MILLS . . . built by Raymond . . . are in the headlines for new high production records on powdered materials.

These big machines are available in several sizes with output ranging from about ten up to forty tons per hour, depending upon the kind of material and fineness of grind.

Super Mills may be equipped with an air drying system for removing moisture from materials while pulverizing . . . as in drying and grinding phosphate rock to 65-mesh fineness, and reducing the moisture content to 1% or less.

When high production is obtained from a single grinding unit, the operating and maintenance expense are relatively low . . . so that Super Mills give record low costs per ton of product.

Write for Roller Mill Catalogs and Bulletins

RAYMOND PULVERIZER DIVISION
COMBUSTION ENGINEERING COMPANY, INC.

1307 North Branch Street, Chicago 22, Illinois

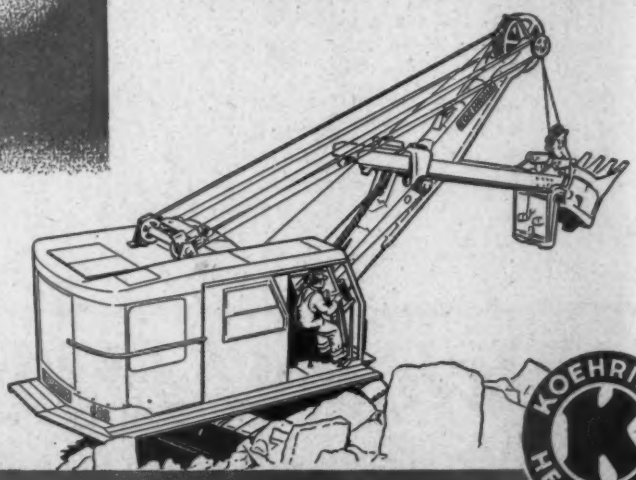
Sales Offices in Principal Cities

Canada: Combustion Engineering Corp., Ltd., Montreal

YOU CAN SEE THE STRENGTH OF THIS STRAIGHT, SPLINED SHAFTING

● Shafting on the Koehring 605 is straight and strong. No shoulders, no steps, no tapers. Gears are mounted to the shafts by means of precision cut splines, not keyways and keys, because splines do not concentrate twisting strains in one spot but disperse them all around the shaft. Strong, straight, splined shafting is another reason why the Koehring 605 handles the toughest jobs, stays on the job when the going gets tough. New 605 Catalog tells the whole story. Get your copy today.

KOEHRING COMPANY
MILWAUKEE 10, WISCONSIN



KOEHRING
605

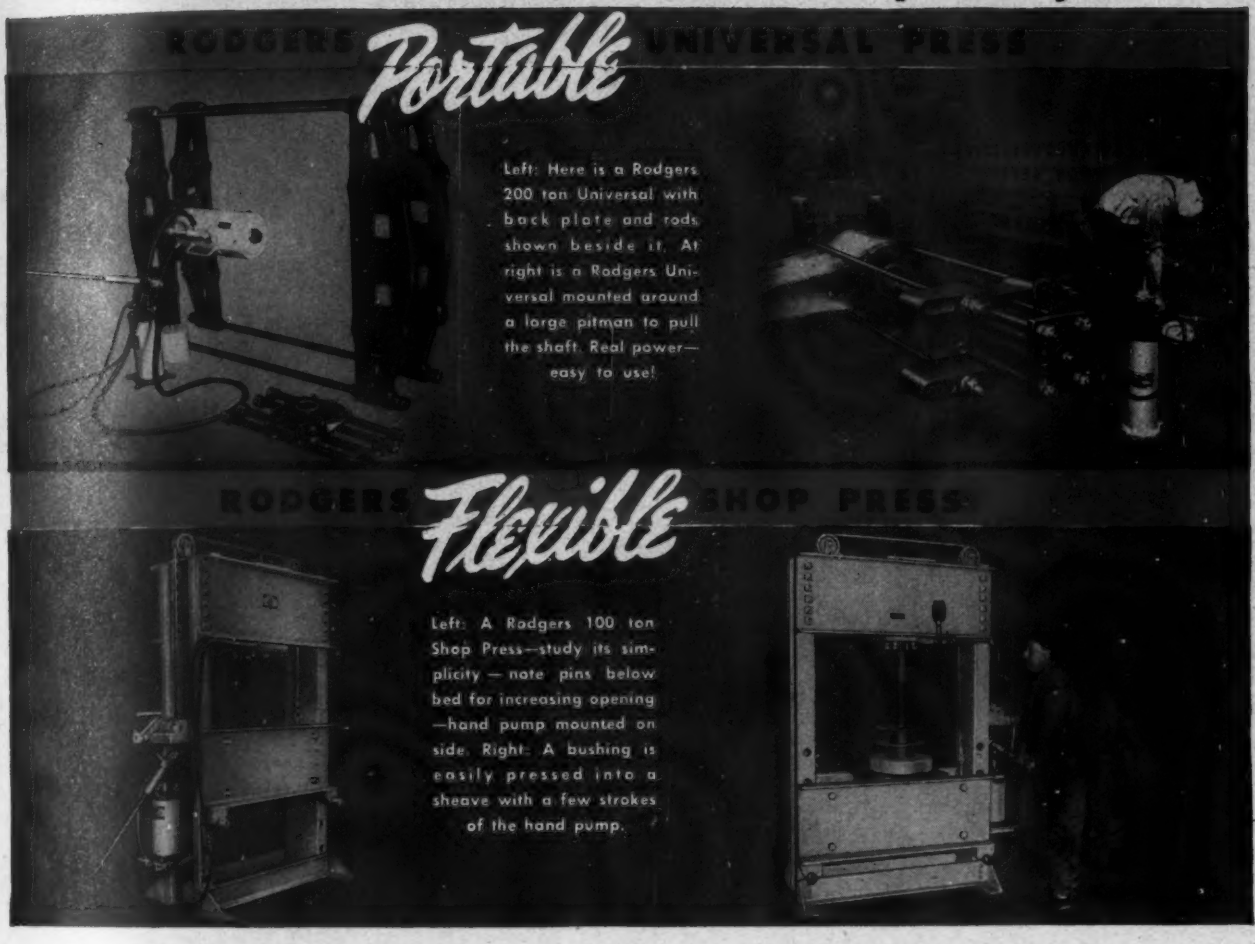
KOEHRING HEAVY DUTY

HEAVY-DUTY CONSTRUCTION EQUIPMENT

2 unusual hydraulic PRESSES

that can save you Time, Labor and Trouble

on 101 maintenance, service and special jobs.



STOP and think of all the uses you can find for these versatile Rodgers Presses — pulling gears, pinions and wheels; pressing shafts, bushings and pins, squeezing, clamping and jacking operations —wherever you need 50 to 200 tons of easily-applied hydraulic power.

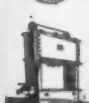
The Rodgers Universal is a unique portable unit for field or shop service. It is used on a stand as an ordinary press, on its side or flat and is easily assembled around equipment for special operations. Rodgers Hydraulic Hand Pump or Power Pump supplies power.

A Rodgers Shop Press is a flexible unit with a bed that is easily raised or lowered to accommodate various size work. Cylinder may be adjusted across entire width of bed. Rodgers Hand Pump or Power Pump furnishes pressure.

If you have equipment to service you can save yourself hours of time and labor with a Rodgers—they often pay for themselves on a tough job or two. Write for *all* the details. It will be profitable.

Send for this new catalog . . .

It will give you complete information on Rodgers Hydraulic Presses. No obligation, of course. Write today.



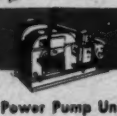
Rodgers Hydraulic, Inc.

hydraulic power equipment


Shop Presses


Crawler-Track Presses

7451 Walker St., St. Louis Park, Minneapolis 16, Minn.


Power Pump Units


Portable Presses

THE combined research, production and distributing facilities of three famous companies are now offered to American industry by The Colorado Fuel and Iron Corporation. Thus, a new nation-wide service is made available in steel, wire products, and allied specialties under the trade-marks of Wickwire Spencer, Calwico, and CF&I—each a standard of industrial progress in its own right.

The East and Middle West will continue to be served by Wickwire Spencer Steel Division. The Colorado Fuel and Iron Corporation will serve the Plains and Mountain States with CF&I facilities as before plus the products of the eastern and western divisions. The California Wire Cloth Corporation (a subsidiary) will supply its own products and in addition the products of the other two divisions to Pacific Coast customers.

The well-earned reputation for quality which these three companies have enjoyed will be maintained in the new and greater Colorado Fuel and Iron Corporation.

CF&I
WICKWIRE SPENCER STEEL DIVISION
The Colorado Fuel and Iron Corporation
THE CALIFORNIA WIRE CLOTH CORPORATION
EASTERN SALES OFFICES 500 Fifth Ave., N.Y. 18, N.Y.
EXECUTIVE OFFICES DENVER, COLORADO
WEST COAST OFFICES OAKLAND, CALIFORNIA
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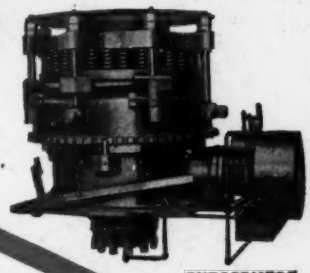
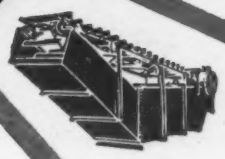
TELSMITH GRAVEL PLANT and QUARRY *Equipment*

When you modernize, expand or build a new plant—Telsmith machinery is the right answer to your production problems. From crushers to bin gates, every unit is designed, engineered, and built "right" *by Telsmith.* And Telsmith selective engineering service fits it to do the job you want done at the lowest operating cost. To push production to new peaks—buy Telsmith. Get Bulletin E-11.

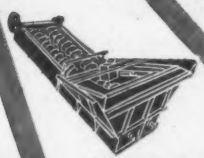
SAND TANKS



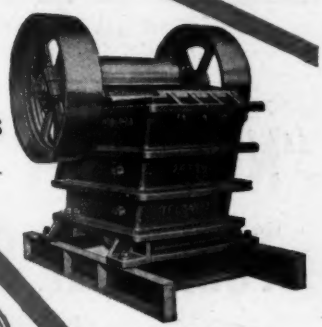
GYRASPHERE CRUSHERS



SAND DRAGS

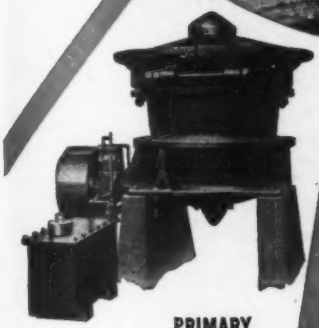


SAND CLASSIFIERS

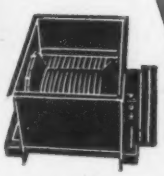


JAW CRUSHERS

BELT AND BUCKET ELEVATORS

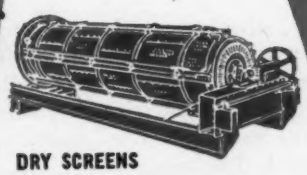


PRIMARY BREAKERS

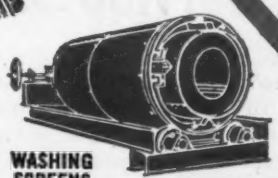


GRIZZLIES

HEAVY DUTY FEEDERS

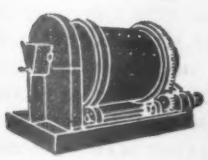


DRY SCREENS

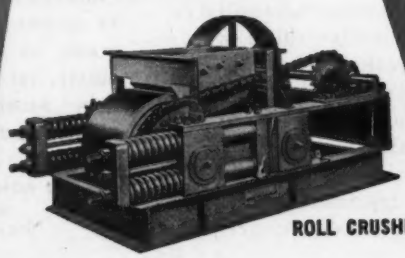


WASHING SCREENS

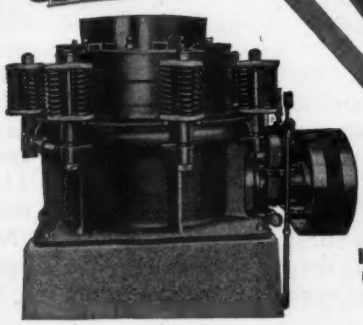
PULSATORS



SUPER SCRUBBERS



ROLL CRUSHERS



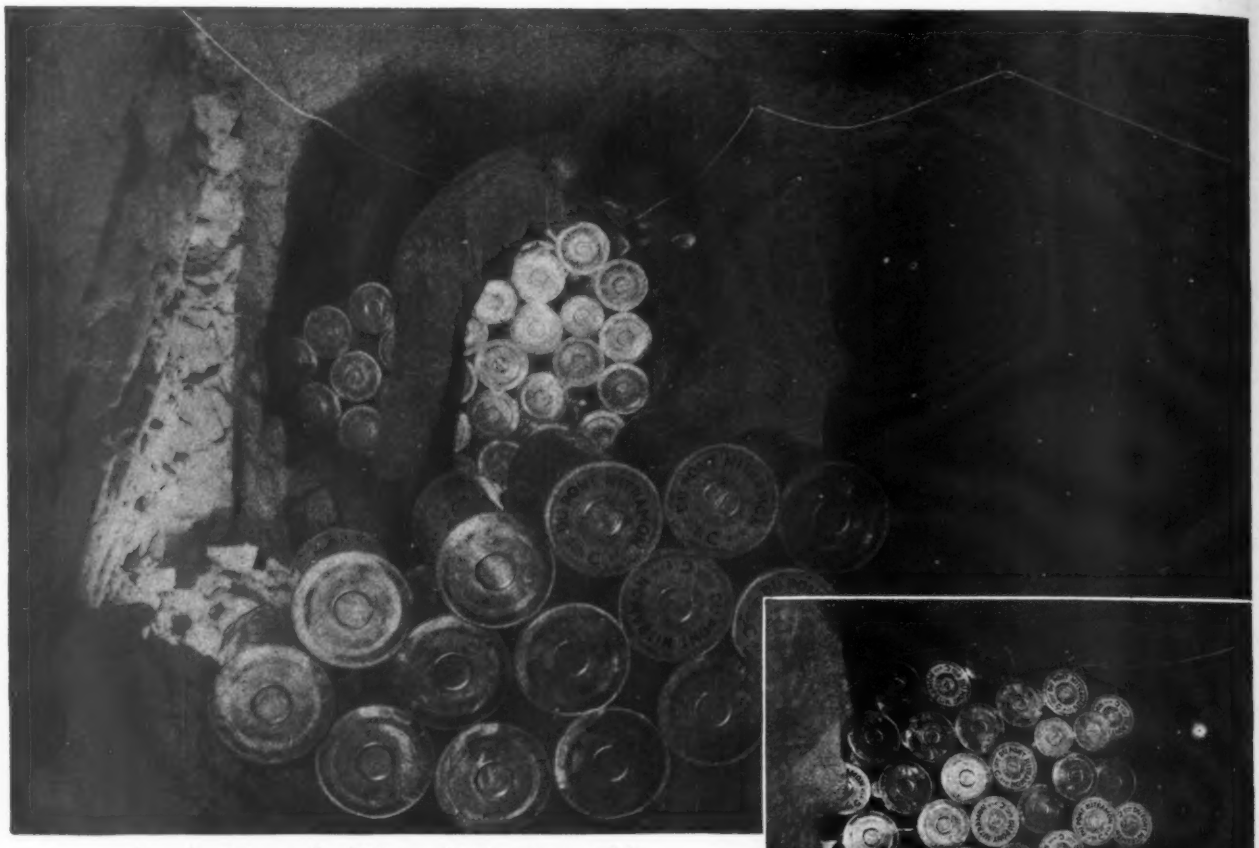
INTERCONE CRUSHERS

E-4

SMITH ENGINEERING WORKS, 508 E. CAPITOL DRIVE, MILWAUKEE 12, WISCONSIN

Cable Addresses: Sengworks, Milwaukee—Concrete, London

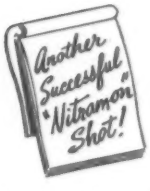
51 East 42nd St. New York 17, N.Y.
211 W. Wacker Drive Chicago 6, Ill.
713 Commercial Trust Bldg. Philadelphia 2, Pa.
247 Third St. Cambridge 42, Mass.
Boehck Eqpt. Co. Milwaukee 3, Wis.
Mines Eng. & Eqpt. Co. San Francisco 4—Los Angeles 14
Brandeis M. & S. Co. Louisville 8, Ky.
Rish Equipment Co. Charleston 22 & Clarksburg, W.Va.
Rish Equipment Co. Roanoke 7 & Richmond, Va.
North Carolina Eqpt. Co. Raleigh, Charlotte 1, Asheville, N.C.
Wilson-Weesner-Wilkinson Co. Knoxville 8 and Nashville 6, Tenn.



Securing Primacord to "Nitramon" Primer in one of the 15 units. Another unit has been started in the foreground.

Some of the 1543 cans of "Nitramon" that were used in this tunnel shot. Note electric light bulb.

"NITRAMON" *and* Du Pont Technical Service *score again in large tunnel shot*



70,000 pounds of "Nitramon" were used recently in a tunnel blast at an eastern Pennsylvania quarry. A Du Pont Technical Service Representative planned and supervised the loading of the "Nitramon" in fifteen units in laterals which extended 100′ left and 170′ right from the 46′ adit. A high face and a heavy horizontal burden amounting to as much as 110′ made this a tough shot. Results, however, were excellent—a clean break and a high ratio of well-fragmented rock per pound of "Nitramon."

The safety features of "Nitramon" permitted the use of ample electric lighting, and thus the loading of the tunnel was facilitated. The rugged "Nitramon" cans were handled rapidly and efficiently—there was no danger of breakage, headaches, or spoilage due to water on the floor. The successful loading and firing of this difficult shot further proves that "Nitramon" is the ideal blasting agent for quarry tunnel shots.

Whenever you have a quarry blasting problem . . . call in a Du Pont Technical Service Representative. He will gladly give you the benefit of his scientific and practical "know how."

"NITRAMON" IS SO SAFE THAT IT CANNOT BE DETONATED BY BLASTING CAPS, OPEN FLAME, OR EVEN THE IMPACT OF A RIFLE BULLET. YET A COMBINATION OF "NITRAMON" PRIMER AND PRIMACORD READILY DETONATES THIS SAFEST BLASTING AGENT.

E. I. DU PONT DE NEMOURS & CO. (INC.)
EXPLOSIVES DEPARTMENT
WILMINGTON 98, DELAWARE

DU PONT "NITRAMON"

DU PONT
REG. U. S. PAT. OFF.

A Product of Du Pont Explosives Research

BETTER THINGS FOR BETTER LIVING . . . *THROUGH CHEMISTRY*

Generally Speaking

July 1, 1946

Dear Reader:

At the rate portland cement production and shipments are increasing, it appears that 1946 output will equal or exceed normal standards, despite delays in getting the long-predicted big highway construction program rolling.

* * * * * * * * * * *

It is gratifying to learn that definite minimum construction standards for all priority housing have been enacted under the Veterans Emergency Housing Program conforming with F.H.A. requirements, to protect veterans' investments. Yet, it is hard to reconcile quality standards with $6000 houses, built at today's prices.

* * * * * * * * * * *

The Building Officials Conference of America, Inc., New York, N. Y., has announced the publication of basic building regulations covering the erection of dwellings and other classes of construction by prefabrication techniques.

* * * * * * * * * * *

Carelessness was responsible for the death of one worker and injuries to three others from electrical shock at the Fayette Limestone Co. quarry near Washington C. H., Ohio. A power shovel used in building a stone bin came in contact with high voltage wires, killing a worker who happened to be standing in water. More education in safe working practices is indicated by accidents such as this.

* * * * * * * * * * *

National Housing Agency reports that homes sold for $6000 or less in 1940 have skyrocketed an avearge of 96.3 per cent in Pacific Coast States as compared with a national average price rise of 65.1 per cent.

* * * * * * * * * * *

Prefabricated home manufacturers, with all the endorsement such homes are receiving from the government, have the best opportunity they have ever had to create public acceptance for their product. Of course that industry is plagued with difficulties—labor and materials—like the rest of the construction industry and unions just don't like department store homes.

* * * * * * * * * * *

In the March, 1946, issue of Cement, Lime and Gravel magazine, London, England, A. B. Searle, consultant, suggests the application of certain blast furnace practices to the burning of lime. He is quoted, "Although the use of a blast of air, supplied through pipes known as tuyers, has long been regarded as essential in blast furnaces, such a device is very seldom used in burning lime and no records appear to exist which show the effect of their use in lime kilns."

* * * * * * * * * * *

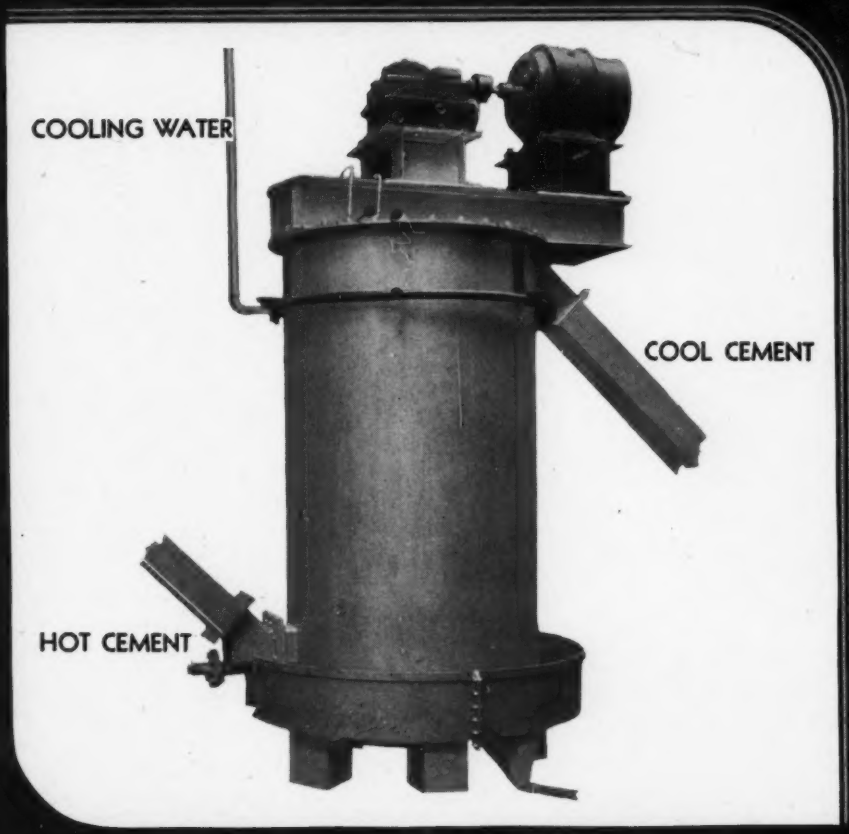
It is possible for a company to secure additional price adjustment if price relief already granted in the industry has proved insufficient to prevent operating at a loss. O.P.A. is set up to extend its individual price-adjustment principle to apply in certain hardship cases.

* * * * * * * * * * *

Western phosphate deposits, which have been a topic for discussion over many years, apparently are being commercialized to increasing extent. The Simplot Fertilizer Co., Pocatello, Idaho, is increasing production facilities to increase output of normal superphosphate fertilizer to about 200,000 tons a year. Phosphate is being ground to 90 percent minus 100-mesh.

(Continued on page 39)

FOR COOLING HOT CEMENT



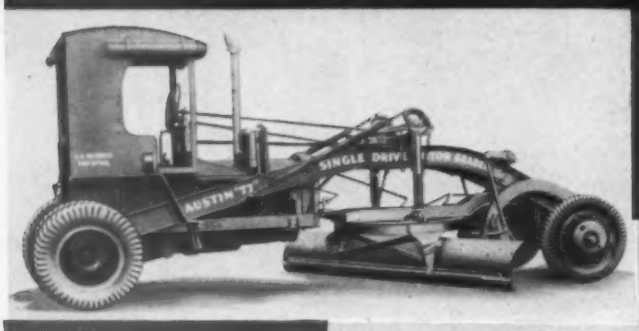
Cement manufacturers are frequently confronted with the problem of cooling hot cement to temperatures acceptable when making bulk shipments or for immediate packing in paper bags. The FLS Cement Cooler was especially developed for cooling hot cement. • The FLS Cooler consists of a tank, water-cooled externally, the cement being introduced into the bottom and conveyed in a thin layer along the inside of the water-cooled wall to the top, where it is discharged. Thus an intimate contact is established between the cement and the water-cooled surface, assuring high-cooling efficiency. • In addition to cement, the Cooler is applicable to many other similar *dry* pulverized materials.

F. L. SMIDTH & CO.

Designers of Cement Making Factories, Manufacturers of Machinery for Making Cement and Lime, etc.

11 WEST 42nd STREET NEW YORK, N. Y.

Thermoid —For Progress in Industry



1932 Austin-Western Motor Grader. The first Austin-Western Grader, equipped with Thermoid Hydraulic Hose, represented a distinct advance in road-building machinery.

Today's Austin-Western Motor Grader. Like every model in the past 14 years, the 1946 Austin-Western Motor Grader is equipped with Thermoid Hydraulic Hose.

Thermoid Powerflex Hydraulic Control Hose used on modern, heavier, more powerful Austin-Western Motor Graders is burst-tested to more than three times the pressure required fourteen years ago. And modern synthetics have solved the old bugbear, deterioration.

In factories, mills and quarries—Thermoid has contributed to industrial progress by manufacturing rubber products that can always be relied upon to do the job for which they were made—plus some more for safety. As engineers and designers evolve machinery *to achieve bigger jobs, faster*—they will continue to find Thermoid products ready for the new assignments.

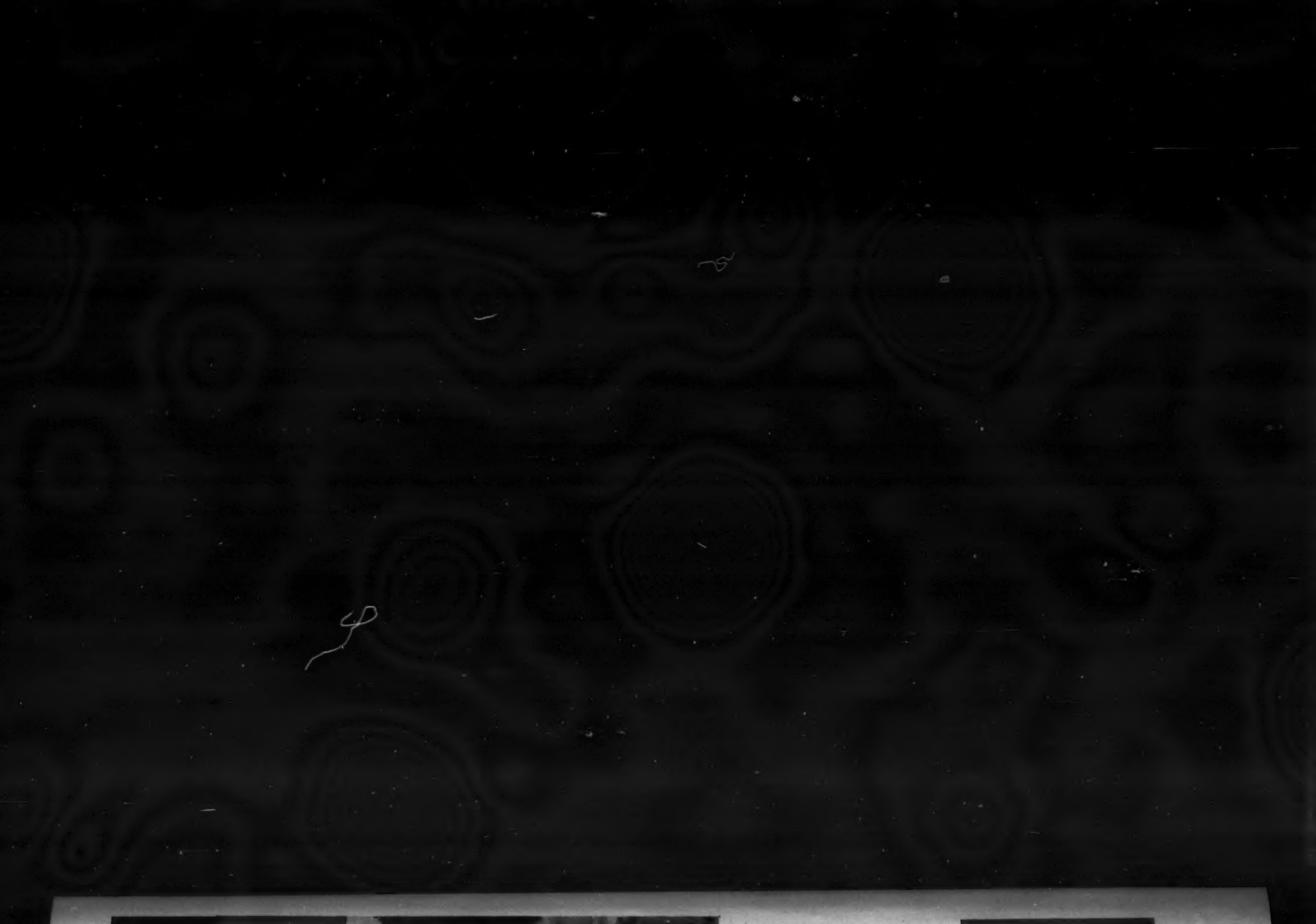
THE THERMOID LINE INCLUDES: Transmission Belting • V-Belts and Drives • Conveyor Belting • Elevator Belting • Wrapped and Molded Hose • Sheet Packings • Industrial Brake Linings and Friction Products • Molded Hard Rubber Products.

Consultation with your Thermoid distributor may develop ways to help you improve processes and reduce costs. Like industrialists everywhere, you will find that when it comes to problems involving hose, belting or friction materials—*it's good business to do business with Thermoid.*

Thermoid Rubber

DIVISION OF THERMOID COMPANY
TRENTON 6, NEW JERSEY

Contributor to Industrial Advancement Since 1880



(Continued from page 36)

After years of experiment, the Fluftrok Corp., Reno, Nev., has started operation of its $200,000 plant for the exfoliation of soft obsidian rock. It is said that when heated in suspension at the proper temperature and conditions, the rock, a rhyolitic obsidian glass, expands up to 16 times its original volume. The aggregate is so light it will float on water, and augments the production of lightweight concrete aggregates which now is far short in supply.

* * * * * * * * * * *

Income tax deductions to cover amounts paid to the government for violation of O.P.A. price regulations are not allowed, whether the violations were willful or not.

* * * * * * * * * * *

Silica continues to assume new chemical roles in industry. B. F. Goodrich Co., in searching for a reinforcing agent for rubber with the strengthening properties of carbon black, minus its discoloring disadvantages, has developed "white soot", a product of sand and alcohol. The product is a powdery "fumed silica" made by subjecting sand to a series of chemical reactions ending with a combustion process which, when commercial production starts, will enable manufacture of rubber products in various colors.

* * * * * * * * * * *

It is permissible for an employer to return to his prewar overtime pay system without the reversion being considered as a wage change by the National Wage Stabilization Board. Wartime orders requiring overtime pay of time-and-one-half for the sixth consecutive work day and double time for the seventh do not have to be followed, in favor of another arrangement before issuance.

* * * * * * * * * * *

Freight tonnage on the Ohio river amounted to 33,867,919 tons in 1945 including 4,097,285 tons of sand and gravel and 164,019 of stone.

* * * * * * * * * * *

Probably companies now can express themselves in writing to their employes, before a collective-bargaining election, as being opposed to a closed shop and get away with it. The National Labor Relations Board, in reversing a previous stand, has held recently that an employer was not coercive in saying by letter that company policy would not require an employe to join a union as a condition of employment.

* * * * * * * * * * *

Thieves evidently are not respectors of weight. Two men recently told a watchman they were instructed to deliver building block, brick and tile to a construction job and drove off with a large truckload.

* * * * * * * * * * *

Concrete block plants in metropolitan areas may anticipate good business in the construction of multi-family buildings when and if O.P.A. works out satisfactory rental values for new buildings.

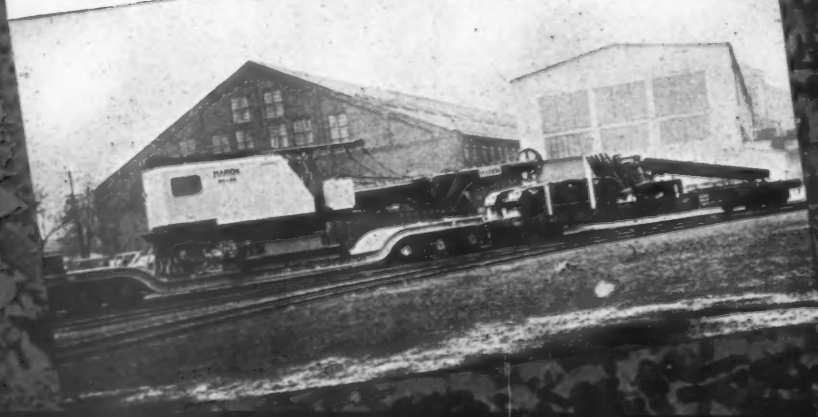
* * * * * * * * * * *

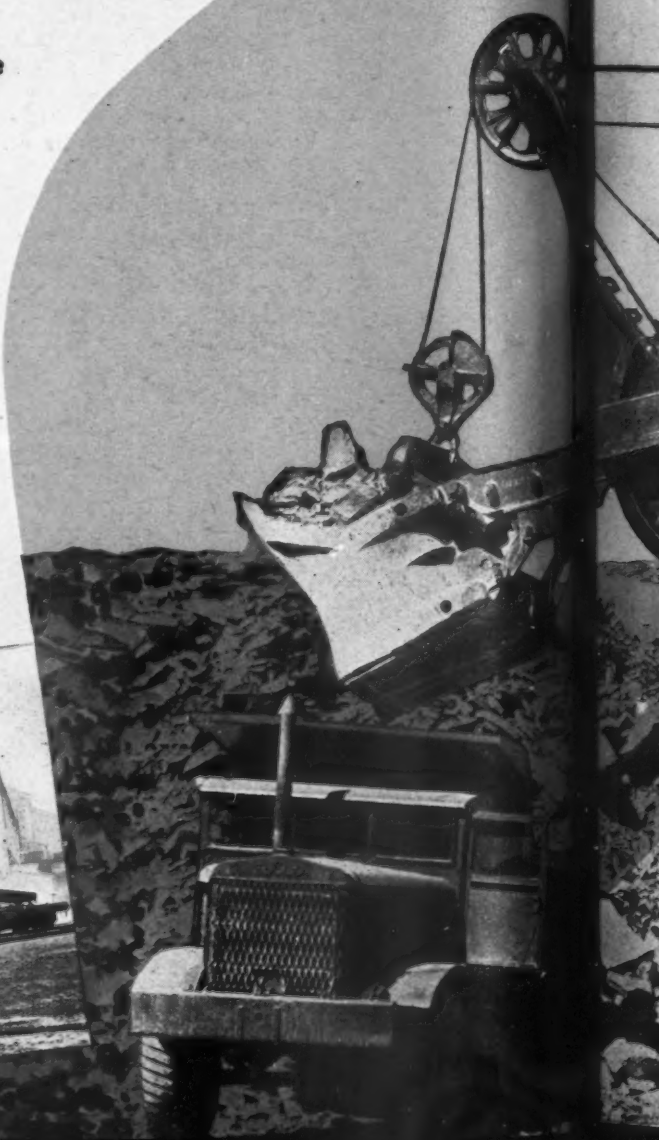
A total of $2,000,000 has been made available to the Secretary of Agriculture for the immediate start of construction of access roads to out-of-the-way government timber lands in order to boost lumber production for the Veterans Emergency Housing Program.

THE EDITORS

You asked for it! Here i
A new, fast, powerfu

Here is a modern, heavy duty Diesel machine that is a top yardage producer in mining, quarrying, and heavy construction. It has the power—speed—and rugged strength to out-perform anything in its class under all digging conditions. It is a REAL MARION through and through. The MARION 111-M is easily and quickly convertible to dragline service. It ships without major dismantling. Let us tell you more about this outstanding performer.





FROM 3/4 CU. YD. POWER SHOVEL COMPANY MARION SINCE 1884 TO 40 CU. YDS.

MARION

★ ★ Editor's Page

There's Hidden Value in Non-Metallic Minerals

ANY PROGRESSIVE MANUFACTURER of goods, or producer of a salable product, is interested in refinement of that product in order to enhance consumer acceptance. That urge motivates industrial progress but also has its place in the field of non-metallic minerals (industrial minerals) even though the end product is a mineral or desired group of minerals recovered by processing crude rocks or ores as they are taken from the earth's crust.

Refinement of these minerals from extraneous accompanying materials usually is a matter of degree; perfection isn't practicable as a rule nor is it metallurgically economical or necessary. But even a very little increment of improvement, chemically, often has economic significance. A small reduction in percentage of one or more undesired or objectionable minerals, such as iron or manganese from glass sand for example, would often open the door to new markets. Silica previously suited only for the manufacture of beer bottles might be made usable for the manufacture of certain classes of glassware; or the already well-refined product melted into high-grade plate glass could become acceptable for optical glass, and so on.

The economic feasibility of adjustment of mineral ratios—in the proper proportioning of silica, alumina, iron and lime—has been demonstrated in the portland cement industry by the subtraction of micaceous and other minerals from argillaceous limestones. Further, combinations of minerals with no market value at all may be processed into salable products, which the Florida phosphate rock industry has done so successfully in re-working debris dumps; and there are by-products in the correction of mineral combinations that sometimes have greater value than the end product sought.

Mineral Values

It seems to us that research along these lines—to exploit fully the mineral values of non-metallic ores—is a fertile field for the extension of markets. There certainly has been much waste of natural resources. From the standpoint of the nation, it is desirable to attain fuller utilization of these resources in order to prolong the life of minerals—at least certain ones. Nothing that can be made usable economically should be wasted.

Unlimited possibilities exist in the refinement of minerals through research. Until a few years ago whoever heard of silicone chemistry—the union of silica with organic compounds to yield a new series of resinous products usable for electrical insulation, for lubrication and, gosh knows, for how many other applications? And who in the industry could forecast that calcium carbonate would substitute for cornstarch in foods? These minerals must first be conditioned through processing and, of course, command a better price than if sold only for their inert values.

The editor's mail is evidence that market potentials for industrial minerals are being intensively explored at this time so we have initiated, in this issue, a series of articles on the subject of froth flotation—one of the mineral beneficiation processes of increasing economic importance in non-metallics. The author, James A. Barr, Jr., particularly well qualified by practical operating experience, will delve into the fundamentals of froth flotation, discuss specific separations of minerals and cover plant design, reagents and equipment in his series.

Flotation

Froth flotation, for those unfamiliar with the term, is defined by Taggart as a method of concentrating solid minerals in a relatively finely divided state—a method of gravity concentration in water in which the effective specific gravity of certain of the ore minerals is substantially decreased by causing air bubbles to attach more or less tenaciously to particles of that particular mineral, whereupon they float on the separating medium while the unaffected particles sink.

Froth flotation is a chemical science of many variables, comprising chemistry of solution as well as film and surface chemistry, that rapidly is proving its practicability in the separation of most any minerals that may be freed from each other as occurring in the ore. The process, with all its reagents for conditioning, collecting and frothing and with its complicated appearing flowsheets would appear, on the surface, high brow or too expensive for use in the processing of low unit price materials.

That is not so. The process has proved economical in cement manufacture where a differential of a few cents in cost per barrel is significant. Phosphate rock is also a low-priced commodity; yet, the major portion of the tonnage in Florida has been floated since perfection of the technique.

Froth flotation has, in recent years, been instrumental in the development of new chemical uses for minerals—in the fields of vitamins, drugs, foods, etc. It has been applied to the processing of acid fluorspar for the manufacture of anhydrous hydrofluoric acid used for high octane gasoline, with a requirement of 98 percent calcium fluoride and a maximum of one percent silica. During the war its application to feldspar, with quartz and micas as valuable by-products, has eliminated expensive hand sorting of too fine grained pegmatites and has prolonged Eastern reserves.

It is being effectively applied to multiple separations of minerals from the same ore in sequence and, recently, to some entirely new separations.

And, in closing this introduction to the series of articles, we might add that the concentration of pitchblende by flotation was an important preliminary step in the development of the atomic bomb.

Bror Nordberg

What B & W knows about Nose Ring Castings . . . CAN SAVE YOU MONEY

Outlasted Others 4 to 1

Unretouched photo (above) of B&W Nose Ring Castings on rotary kiln, still in service after three and one-half years of severe use. Previous castings on same kiln failed after approximately nine months' service. Other installations have served nearly five years and are still going strong.

FOR five years, cement plants having serious difficulty with the discharge ends of kilns were the subject of an intensive study by B&W engineers. Many of the problems revealed by these field studies were solved by the development of B&W High-Alloy Nose Ring Castings, which are now performing satisfactorily in a number of prominent cement plants. B&W Nose Ring Castings can help you reduce kiln maintenance and avoid costly shutdowns for several reasons:

1. Reinforcing ribs, in compression against kiln shell, keep castings straight and true, and prolong brick life. Belling out and warping of kiln mouth, due to expansion of castings, overcome by improved design and method of mounting castings.
2. Special alloy of 25% Chromium—20% Nickel, developed by B&W for nose ring service, has superior oxidation-resistance and low rate of permanent growth, giving castings longer service life.
3. Initial installation costs are lower than for conventional designs because B&W Castings are much smaller and lighter in weight. B&W has pattern equipment for most standard sizes—which usually means quicker delivery and elimination of pattern charges.

Let us tell you more about the advantages of B&W Nose Ring Castings.

S-70

Water-Tube Boilers, for Stationary Power Plants, for Marine Service . . . Water-Cooled Furnaces . . . Superheaters . . . Economizers . . . Air Heaters . . . Pulverized-Coal Equipment . . . Chain-Grate Stokers . . . Oil, Gas and Multifuel Burners . . . Seamless and Welded Tubes and Pipe . . . Refractories . . . Process Equipment.

BABCOCK & WILCOX

THE BABCOCK & WILCOX CO.
85 LIBERTY STREET, NEW YORK 6, N.Y.

Rocky's NOTES

Nathan C. Rockwood

The $64 Question

PROBABLY NO QUESTION is more difficult for the average producer to answer than: "Shall I proceed, as planned, to rehabilitate, re-equip and expand my production facilities?" The enthusiasm a year ago to spend money for these purposes was very great, based on boom expectations in all lines of industry, and particularly in the construction industry. Since then every development has served to dull the enthusiasm and discount expectations.

These developments might have been foreseen and foretold, and could possibly have been avoided by a vigilant and public-spirited administration and Congress. Lack of interest in civilian production, excessive labor demands, price and credit inflation, general restlessness have always followed long wars in this country. It was so after the Civil War and after World War I. Our memory of 1919-20-21 is very short, or we would see many parallels.

While politicians worry, or at least pretend to worry, about unemployment, employers have a difficult time finding labor enough to staff their industries—just ordinary people who are willing to do a day's work for a day's pay. Young men stand on street corners, or hang around pool rooms, and discuss quite frankly the various possibilities of "more pay for less work." For many returning service men the immediate incentive to go back to work is lacking because of terminal leave pay, bonuses in one form or another, and from six month's or year's unemployment compensation.

No one begrudges the service man the gratitude of his country and his state, expressed in terms of money, if that is the only way his fellow citizens can think of for compensating him. However, one may logically question the wisdom of pampering young citizens, whether ex-service men or not, because of the blighting effects on the characters they subsequently bear for a lifetime.

One can not dodge the well-known law of science that "action and reaction are equal and opposite." The bonuses and loans the ex-service man is granted are counteracted by his having to pay $10,000 for a dwelling that should not cost him more than $5,000. The Federal Government would have served him far better by keeping costs of construction, including wages, within his buying power through intelligent exposition of economics involved and an appeal to labor not to rock the boat but to give the country a fair chance to readjust itself. You may say it couldn't have been done. The point is it wasn't even tried. Indeed, the exactly opposite course was pursued.

When Will Reaction Come?

The reaction after this war will now have to come the hard way, as it always has before. There are evidences on every side. The question is no longer, will it come? but when will it come? To the producer this is resolved into the question, "shall I proceed as originally planned?"

Producers and manufacturers, in the aggregate, made tremendous plans for reëquipment and rehabilitation and expansion. The financial statements of practically all business and industry showed the largest current assets in history; these funds were accumulated specifically to take care of post-war expenses of rehabilitation and expansion. But, estimates and plans were based largely on pre-war costs; if employers had banded together and explained this to their employes and to all the people of this country, it might have been a restraining influence on the headlong plunge into inflation of wages for political purposes.

Producers are therefore faced with "cutting the cloth to the suit," or nearly doubling their estimates, and seeking new capital to supplement their savings and surplus. The venturesome will go ahead. We already have the example of the National Gypsum Co., which proposes to issue 275,000 new shares of common stock, to supplement its already large cash assets, to provide funds for expansion and rehabilitation. There will be some, doubtless, who decide to make the most use possible of present facilities, and "wait and see" what happens in the next two or three years.

Such producers will have some idea of whether or not present wage rates and prices can be maintained; and, will cheap money (low interest rates) continue? David Lawrence's *United States News*, says that union labor leaders explain that they have called strikes (among other reasons) because it was considered necessary to impress employers with union strength . . . and that many workers welcomed a rest period after the long hours of war-time work. This sounds logical and follows the pattern of the aftermath of World War I. It is a psychological reason and accounts for lack of reasoning out the ultimate results. The strikers have gained little or nothing because they have lost much work time and the wages that would have gone with it, and they have increased the cost of living to themselves, along with every one else. They have greatly increased the costs of doing business, the full results of which will be a long time in showing up.

The experience of the past shows that there will be a reaction; some prognosticators say in the latter half of 1947 or the first half of 1948. That is about the time interval that followed the first World War. By then every one will have sobered up a bit, and be more in a mood to do some real work. More work, or more conscientious work, even at present wage scales, would bring down costs and prices. Possibly, by then, people will be willing to accept lower rates of wages in return for steadier employment—guaranteed annual wages is the announced goal of some of the union labor leaders.

Easy Money

Nearly all the financial authorities seem to agree that the easy money situation will continue for a long time. The U. S. Department of Commerce estimates that 250 billion dollars in cash and government securities have been accumulated by business and individuals (some 25 billion in cash, 75 billion in demand deposits, 50 billion in time deposits and 100 billion in U. S. securities. Producers and manufacturers with sound businesses certainly will have no trouble obtaining additional capital at low rates. However, invested in plant and equipment at present costs, new capital will water down present securities' values as represented by real assets, provided it turns out later that these plants could be replaced, or duplicated, at much less investment cost. It is a question of whether profits in the near future will justify raising new capital or not; and possible continuation of O. P. A. price ceilings on capital goods is undoubtedly a significant factor, at this writing.

FOR EFFICIENT *Dust recovery*

SPECIFY BUELL'S exclusive... 6

"Buell's Exclusive 6" refers to the six design features which distinguish Buell (van Tongeren) Dust Recovery Systems from all other mechanical dust collectors.

These six mechanically-important features have made possible a three-point record of achievement in industrial dust recovery: (1) high operating efficiency (2) minimum cost of maintenance (3) long life. A record of *guarantees fulfilled*, of *virtually trouble-free service.*

"Buell's Exclusive 6" are briefly described in the paragraphs immediately below. In following sequential advertisements each feature will be separately illustrated and described in interesting detail.

1 The "Shave-Off" . . . The patented van Tongeren principle, exclusive with Buell. Utilizes the "double eddy" current, establishing a highly efficient collection force.

2 Large Diameters . . . Permit use of extra thick metal. Afford large dust outlets, prevent clogging. Reduce abrasion.

3 Extra-Sturdy Construction . . . Rolled and welded, one piece construction; hoppers braced with 3" channels to withstand vibration.

4 Correct Hopper Design . . . Plays a most important, often disregarded, part in dust collection efficiency. Dust disposal facility must be anticipated in the initial overall design.

5 Split-Duct Manifolding . . . A prime factor in efficient distribution of the dust load. Buell's manifolding method has flexibility, discharging gases from any side or end.

6 Inner Welds Ground Smooth . . . Proper finishing of inner welds effects operating efficiency, reduces erosion, ensures longer life.

Buell's book—"The van Tongeren System of Industrial Dust Recovery"—illustrates and explains the patented van Tongeren principle and its many applications to industry.

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DUST RECOVERY SYSTEMS

BUELL ENGINEERING COMPANY, INC.

2 Cedar Street, Suite 5000, New York 5, N. Y.

Sales Representatives in Principal Cities

DESIGNED TO DO A JOB, NOT JUST TO MEET A "SPEC"

Washington NEWS

DRASTIC ACTION recently was taken by the Civilian Production Administration to bring construction authorizations into balance with the supply of building materials with an order to its field offices to reduce dollar value of authorizations by two-thirds for at least 45 days. The situation will be reviewed about July 15 to determine whether this regulation may be relaxed. Administrator John D. Small said that this action was taken because of the large volume of construction already under way or authorized, and the impact of strikes on production of scarce building materials. The two-thirds reduction in authorizations is to be in comparison with the rate of authorizations in the CPA construction districts for the two-week period ending May 23. Some latitude will be given regional offices to take into account exceptional circumstances and to vary the reduction rate between districts if necessary.

Building Material Shortages

Strikes have cut down the production rate of building materials, but car shortages and even scarcity of labor have been the other important factors. For example, in certain areas reports have been coming in of cement shortages. These shortages are not due to lack of capacity. Bureau of Mines reports for April, the latest figure available, show that production gained 79 percent over the same month a year ago but that productive capacity of the industry was only being used up to 64 percent. With the coal and rail strikes out of the way, cement companies expect to get into full production and catch up with demand.

Wallboard companies are finding the paper shortage a bottleneck which has been difficult to overcome, but production is going steadily upward with March shipments totalling 237,045,000 sq. ft., a gain of 23 percent over February.

Subsidy Payments

National Housing Expediter Wilson W. Wyatt has started holding meetings with representatives of three building materials industries; namely, softwood-plywood, structural clay products, and gypsum paper liner. The plan submitted for consideration of the clay products industry provides for premiums to be paid to producers for output in excess of quota designated for each plant, such quota to be based on the plant's production in selected months of 1946 prior to June. Premiums on structural clay products would also be payable on increases above quotas starting June 1, and would apply to output of common and face brick (glazed and unglazed) and structural facing tile (glazed and unglazed).

The concrete products industry quite naturally is very much interested in the plan for subsidy payments to the clay products industry. To a great degree, the problems of the concrete products industry parallel those of the clay products industry. Yet there seems to be a very solicitous attitude toward clay products while the concrete products industry is treated like a step-child. Reports coming from all sections of the country indicate that its petitions for reasonable increases in price have been ignored to the point where, in some cases, the only recourse has been a shut-down. The concrete products industry and, in fact, the entire building materials industry, did not favor subsidies as a principle, but only desired a fair, reasonable increase in prices. However, the concrete products industry will certainly not stand for any discriminatory action in the matter of subsidy payments.

California Block Price Increase

Producers of concrete block in Los Angeles, Riverside, San Bernardino, and Orange counties, California have been granted increases under section 17 of MPR regulation No. 592, Office of Price Administration. The adjusted maximum prices of the various sizes are as shown below.

Other sizes. The adjusted maximum price of a concrete building block of a size not listed in paragraph (b) shall be the adjusted maximum price provided in that paragraph for the most comparable size of the same type (that is, either hollow, cap or solid) multiplied by the ratio of the cubic content of the unlisted block and cubic content of the comparable block.

Handling charge. Sales of less than 1,000 blocks are to be priced in proportion to the price provided for 1,000 blocks except that an additional charge of $1.00 may be made for any single sale.

Boston Ready Mix Prices

The OPA has announced an order dated May 15 that maximum prices for ready mixed concrete have been increased in the Boston area, including Cambridge, Chelsea, Revere, Everett, Malden, Medford, Somerville, Newton, Quincy, Winthrop, Arlington, Belmont, Watertown, Brook-

(Continued on page 100)

Dimensions	F.o.b. plant—maximum price per 1,000 blocks: Hollow	Cap	Solid	Addition for delivery—miles from producer's plant: Under 12	12-20	Over 20
2x4x6 in.	...	...	$16	$2.00	$4.00	$6.00
2x4x8 in.	...	...	17	2.50	5.00	7.00
2x4x12 in.	...	...	28	3.50	6.50	9.00
4x4x12 in.	$37	$42	47	4.50	8.00	11.50
4x6x12 in.	48	53	70	5.50	10.00	14.50
4x8x12 in.	59	64	95	6.50	12.00	17.00
4x12x12 in.	84	90	110	9.00	17.00	23.00

The maximum prices provided in the table below apply to all producers located in 29 Palms, Calif., and Joshua Tree Townsite, Calif.:

Dimensions	F.o.b. plant, maximum price per 1,000 blocks, hollow	Addition for delivery, miles from producer's plant: Under 10	10 or more
4x4x12 in.	$46	$10	$15
4x6x12 in.	58	10	15
4x8x12 in.	70	10	15

The maximum prices provided in the table below apply to all producers located in Beaumont, Calif.:

Dimensions	F.o.b. plant, maximum price per 1,000 blocks, hollow	Addition for delivery miles from producer's plant: Under 12	12-20	Over 20
4x6x12 in.	$53.50	$5.50	$10	$14.50
4x8x12 in.	65.50	6.50	12	17.00

Quick Facts About

ATLAS DURAPLASTIC

TRADE MARK REG. U. A. C. CO.

THE AIR-ENTRAINING PORTLAND CEMENT

That Makes Better Concrete at No Extra Cost

1. Complies with ASTM specifications: Provides the proper amount of entrained air by intergrinding with the cement the precise amount of air-entraining material needed for satisfactory field performance.

2. No extra cost: Sells at the same price as regular cement. Produces concrete that spreads, screeds and finishes more easily. Calls for no additional materials—merely the same care and good workmanship regularly employed.

3. Better concrete: Makes concrete more workable, more plastic, more cohesive and more uniform throughout.

4. More durable concrete: Requires less mixing water for a given slump; minimizes segregation and bleeding; tends to reduce manipulation scale; fortifies the concrete against freezing and thawing weather; renders paving concrete highly resistant to scaling action of de-icing salts.

5. Makes better concrete block: Reduces breakage, improves appearance, lowers water absorption and generally increases strength.

6. Called Duraplastic because it makes concrete more durable and more plastic.

Atlas Duraplastic air-entraining portland cement was originated and developed by Universal Atlas Cement Company. It is backed by eleven years of field and laboratory tests and research and proved by seven years of successful field performance. Duraplastic is specified by an increasing number of architects, engineers, contractors, dealers, ready-mix operators and concrete products makers. It is used for general concrete work—for paving, sidewalks, foundations, walls, gunite, slip-form work and concrete pipe and block.

Send for further information. Write to Universal Atlas Cement Company (United States Steel Corporation Subsidiary), Chrysler Building, New York 17, N. Y.

RP D-35

OFFICES: New York, Chicago, Philadelphia, Boston, Albany, Pittsburgh, Cleveland, Dayton, Minneapolis, Duluth, St. Louis, Kansas City, Des Moines, Birmingham, Waco.

"HOUR OF MYSTERY"—Sponsored by U. S. Steel—Sunday Evenings—ABC Network

A UNIVERSAL ATLAS PRODUCT

the *Personal Side* of the news

Canada Crushed Stone

H. S. ALEXANDER, St. Clair Balfour, C. H. Doolittle, R. R. Evans, R. G. L. Harstone, and Alan V. Young, were appointed directors of the Canada Crushed Stone, Ltd., Hamilton, Ont., Canada, at the recent annual meeting of the company. The following officers were elected: Alan V. Young, president; R. G. L. Harstone, vice-president and managing director; D. E. Steele, assistant secretary and treasurer.

Queenston Officials

R. G. L. HARSTONE has been elected president of the Queenston Quarries, Ltd., Hamilton, Ont., Canada. A. Michie has been named vice-president and general manager; D. E. Steele, secretary; and C. H. Doolittle, treasurer. All were appointed directors together with R. R. Evans, H. P. Frid and D. H. Henderson.

Joins P.C.A.

R. P. NEWLAND has joined the Spokane, Wash., office of the Portland Cement Association as principal assistant to S. Carl Smithwick, district engineer. Mr. Newland, until recently district highway engineer, will assist in furnishing technical advice and assistance to users of cement in the highway and conservation fields.

Named Vice-President

CHARLES S. OLMSTED, general superintendent of the Lake Majella, Calif., sand plant of Del Monte Properties Co., Del Monte, Calif., has been appointed a vice-president of the company. Mr. Olmsted will continue his duties as head of the Pacific Grove Division which includes the operation of the sand plant, which supplies large glass companies, foundry men, manufacturers of white stucco and sand blasters. Mr. Olmsted started in 1897 as assistant engineer of the Pacific Improvement Co., predecessor of Del Monte Properties Co. When S. F. B. Morse, present chairman of the company, became manager of Pacific Improvement in 1915, he placed Mr. Olmsted in charge of the company's road system and engineering work as well as the operation of the sand plant.

Charles S. Olmsted

Sales Manager

JAMES C. MCCLURE, formerly district sales manager of the Albany, N. Y., office of the Universal Atlas Cement Co., has been appointed sales manager of the new office at Dayton, Ohio. HARRY E. BERGOLD, fieldman in the Rochester area, will succeed Mr. McClure as district sales manager with headquarters at Albany. Mr. McClure joined the company in 1927 and served successively as technical service engineer in Ohio, technical service manager in Pittsburgh, and since 1938 as district sales manager in Albany. He is a member of the Ohio Society of Professional Engineers and the American Concrete Institute. Mr. Bergold has occupied sales positions with cement companies and others in Buffalo, New York City and Rochester since 1930. He joined the staff of the Universal Atlas Cement Co. in 1941.

James C. McClure

Carney Appointments

LAWRENCE MORRIS, recently personal affairs consultant in the Army Air Forces, has joined the Carney Co., Mankato, Minn., as personnel director. WILLIAM H. SCOTT, formerly associated with the U. S. Steel Co. in the engineering and production departments, has been named chief mechanical engineer. CLAYTON BOWE, who was special accountant in the office of the vice-president and comptroller of the C.M.St.P.&P. R.R. in Chicago, has been made chief accountant.

William H. Scott

Becomes Partner

E. CONRAD CARLSON has become a partner in the S. T. Burton Co., Chicago, Ill., distributor of rock wool and other building products. For the past five years, Mr. Carlson has been identified with Sanderson & Porter, engineering constructors, as director of purchases. During the war years he had charge of the procurement of materials and supplies in the amount of $73,000,000 during construction and operation of the Elwood Ordnance plant at Joliet, Ill. Prior to this connection, Mr. Carlson was associated with McLennan Construction Co. and the R. C. Wieboldt Co.

Director of Engineering

R. E. COPELAND has joined the staff of the National Concrete Masonry Association, Chicago, Ill., as director of engineering, and will devote his full time to research and development of the concrete masonry industry.

In Partnership

MERRILL S. BIRD, recently released from the Army, has been taken into partnership with Nate C. Hannaford

Merrill S. Bird

in the Des Moines Concrete Products Co. Mr. Bird entered the service in March 1943, served as a Sergeant in the 6th Army Engineers, and was in the Philippines, Leyte, Luzon, New Guinea, and Australia before his release in Jan. 1946. Prior to entering the Army, he spent eight years as a salesman for the Lehigh Portland Cement Co.

Warner Official Retires

A. D. WARNER, JR., has retired as treasurer of Warner Co., Philadelphia, Penn., after 46 years of service, but will continue as vice-president in an advisory capacity. Mr. Warner was elected treasurer in 1902 and handled all financial details in connection with the company's mergers with smaller companies and the large Van Sciver Corporation. He was also instrumental in simplifying the capital structure of the company for future development and enlargement.

CHARLES WARNER, JR., was elected treasurer to fill the vacancy left by Mr. Warner's retirement. He will continue as secretary but his former position as assistant to the president has been discontinued.

R. G. Rauscher, comptroller, has been elected to the board of directors of the company, succeeding F. M. Hardt, who retired.

FRANK R. CARMAN, industrial relations manager, has been appointed chairman of the industrial relations committee in place of Charles Warner, Jr.

IRVING WARNER, JR., has been appointed industrial engineer and will work in the engineering department. This appointment does not cover the Bellefonte Division, where industrial engineering is done by John Smith, under A. C. Hewitt. Mr. Warner is the son of Irving Warner, vice-president in charge of engineering, purchasing and research.

Ideal Changes

FLOYD DIXON has been appointed chief clerk of the Nebraska Cement Co., Superior, Neb., replacing Ed C. Noren, who has resigned. E. A. THOMY has resumed the duties of chief clerk at Hanover, Mont., succeeding J. R. Gwin, recently promoted to chief clerk at Portland, Colo.

Superintendent Iowa Plant

EDWARD C. CASTELL, associated with the sand and gravel industry for a number of years, has been made superintendent of the L. G. Everist, Inc. plant at Hawarden, Iowa. Mr.

Edward Castell

Castell assumed his new duties in February, 1946, and was formerly associated with J. W. Peters and Sons, Material Service Corporation, Chicago Gravel Co., and McElwee and Rogy.

Made General Manager

ALFRED N. FOLEY has joined the West Roxbury Crushed Stone Co., West Roxbury, Mass., as general manager. He was superintendent of the Highland Sand and Gravel Co. of West Roxbury.

40th Anniversary

SURPRISES were in order recently for E. J. Krause, president of the Columbia Quarry Co., St. Louis, Mo., when the office force and superintendents celebrated his 40th anniversary as president of the company.

Quarry Inspector

FRANCIS CROWTHER of Metaline Falls, Wash., has been appointed State inspector of mines and quarries, with headquarters in Spokane. He has been employed by the Pend Oreille Mines and Metals Co.

In Partnership

W. J. WELP, owner of the Fort Dodge Limestone Co., Fort Dodge, Iowa, has taken his two sons, Robert R. and Ambrose, into partnership. Both served in the Navy and were recently released. Robert was a Lieutenant (j.g.) serving for three years, of which 16 months was in the South Pacific. He served on the Saratoga, the aircraft carrier that was bombed and sunk, as well as two other carriers. During his service in the States he worked on aircraft maintenance. Ambrose was a motor machinists mate 2/c, in the Amphibious Division, was overseas in the South Pacific for two of the three years that he was in service, and participated in the invasion of Kwajalien and Eniwetok, as well as Okinawa. He also saw service at Saipan and the Philippines. Robert was released in April, 1946, and Ambrose received his release in November, 1945.

Father takes sons into partnership. From left to right: Ambrose Welp; W. J. Welp, father; and Robert R. Welp

P.C.A. Vice-President

DR. A. ALLAN BATES, outstanding scientist and chemical engineer, has been elected vice-president of the newly created Division of Research

Dr. A. Allan Bates

and Development, Portland Cement Association, Chicago, Ill. Dr. Bates is widely known for his accomplishments in the fields of chemistry, chemical engineering, ceramics and metallurgy. Since 1938 he has been manager of the Chemical, Metallurgical and Ceramic Research Division of the Westinghouse Electric Corp. Previous to that he was Professor of Metallurgical Engineering at Case School of Applied Science. He holds a Bachelor of Arts degree from Ohio Wesleyan University, where he majored in chemistry; Bachelor of Science in metallurgical engineering from Case School of Applied Science; Doctor of Science, "Magna cum laude," from the University of Nancy, France; and an honorary degree of Doctor of Engineering from Stevens Institute of Technology.

Heads Association

STUART H. RALPH, vice-president and director of the Flintkote Co., Inc., New York, N. Y., has been elected president of the Asbestos Cement Products Association, succeeding Samuel P. Moffitt. Other officers are: E. W. Smith, vice-president; and Donald M. Tulloch, secretary and treasurer.

Reenters Block Business

GEORGE C. ISBELL, who produced concrete masonry units at Alta, Iowa from 1905 to 1922, has reentered the concrete block field. He started production last April in Correctionville, Iowa, with a Gilsted and Hebron tamper, capable of producing 1200 units per 8-hour day. Equal amounts of concrete sand and masonry sand are used together with high early strength cement, mixed in a Gilsted and Hebron mixer, and carried by a drag chain to the block machine. Mr. Isbell's son, James, a returned war veteran, is assisting his father in the plant. George Isbell was mayor of Correctionville from 1926 to 1932.

Heads P.C.A. Bureau

EZRA C. WENGER, for the past 11 years regional highway engineer for the Portland Cement Association, Chicago, Ill., has been placed in charge of the new Conservation Bureau of the Association. This Bureau has been set up to correlate technical information and assist users of concrete in the fields of water supply, sewage disposal, flood control, river and harbor development, shore and beach protection, soil erosion control, drainage, irrigation, reclamation, and hydroelectric developments. Previously Mr. Wenger was chief engineer with a consulting firm specializing in waterworks and sewerage projects. He has also held engineering positions with the Kansas Highway Department and the Illinois Division of Highways.

Takes Over Plant

EDGAR M. BROWN has taken over operation of the Brown Sand and Gravel Co. plant, Pasco, Wash., from Harold Matheson who has been operating the plant on a lease basis for several years. Associated with Mr. Brown as a partner will be his son-in-law, Louis M. Jones.

Retires

P. C. TENNANT, national sales representative for the Texas Co., has retired from active duty after 18 years of continuous contact with the cement and other rock products industries. He has a modern little farm on R. D. 3, Nazareth, Penn., where he intends to spend his leisure time.

Made Works Manager

JOHN OWEN LEWIS, superintendent of the Hamlin, Texas, gypsum plant of The Celotex Corp., Chicago, Ill., has been appointed works manager. Mr. Lewis was board plant superintendent for the Texas Cement Plaster Co., Hamlin, Texas, at the time it was acquired by The Celotex Corp. in 1945.

Hawkeye Promotions

G. F. HETHERINGTON, vice-president and general sales manager of the Hawkeye Portland Cement Co., Des Moines, Iowa, has been elected president, succeeding Thomas J. Guthrie, chairman of the board. Maurice C. Miller has been named vice-president, and H. R. Merrick was reeelected secretary-treasurer.

OBITUARIES

JOSEPH H. JACKSON, vice-president and director of The Carbon Limestone Co., Youngstown, Ohio, and Hillsville, Penn., died May 26, after a long illness. He was 52 years old. Mr. Jackson had been connected with the company since 1918. He was also vice-president of the Carbon Concrete Brick Co.

JAMES H. MCNAMARA, founder and president of the Eagle Rock Lime Co., Eagle Rock, Va., and treasurer of the National Lime Association, died May 15 at his home in Eagle Rock. Just seven weeks prior he attended the Board of Directors meeting and convention of the Association at Hot Springs, Va., where he submitted his annual report as treasurer.

ERIC J. OCHS, who was superintendent of the Green Bag Cement Co. of Pennsylvania, Pittsburgh, Penn., until his retirement in 1938, died May 11 at his home in Painesville, Ohio. Mr. Ochs had lived in Painesville since 1925 when he went there to supervise construction of the Standard Portland Cement Co. plant and became its first superintendent.

FRANK L. GAUTIER, director and vice-president of the Consolidated Rock Products Co., Los Angeles, Calif., passed away recently at his home in San Gabriel, Calif. Mr. Gautier was born on the present site of the Consolidated Rock Products Co., and had been engaged in the sand and gravel business for the last 33 years. He was a graduate of the Engineering College of the University of California.

J. STEWART ELWELL, director and sales manager of the Western Lime and Cement Co., Milwaukee, Wis., passed away May 20, after a short illness.

DOUGLAS L. BOYER, sales manager of the phosphate division of Monsanto Chemical Co., was one of the victims of the LaSalle Hotel fire disaster in Chicago, Ill., on June 5. He was 55 years old.

HAROLD DRAKE, purchasing director of the National Gypsum Co., Buffalo, N. Y., died May 11 at his home in Buffalo. Mr. Drake joined the company as purchasing agent 20 years ago, just three months after it was formed. He was 50 years of age.

THOMAS BRAWLEY MILES, owner and operator of the Summerville Sand and Gravel Co., Summerville, S. C., passed away recently at the age of 70.

REUBEN P. REED, sales manager of the Big Rock Stone and Material Co., Little Rock, Ark., died May 23. He was 52 years old. Mr. Reed had been with the company for 20 years.

Take a LOAD off your Engines

DON'T let power-stealing by-products of oxidation put an extra load on your heavy-duty gasoline and Diesel engines. Lubricate them with *Texaco Ursa Oil X★★*. This great oil has extremely high resistance to oxidation, and is both detergent and dispersive.

Texaco Ursa Oil X★★ keeps engines clean and holds deposit-forming materials in suspension until drained — assures free rings, better compression and combustion. It reduces engine wear and protects alloy bearings against corrosion.

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To get better performance from air compressors, contractors everywhere give them the effective lubrication of *Texaco Alcaid, Algol or Ursa Oil*. These famous oils assure wide-opening, tight-shutting valves, free rings, continuous air supply, fewer repairs and overhauls.

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TEXACO Lubricants and Fuels

TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT — CBS

news OF THE INDUSTRY

I. C. C. Orders Carriers to Revise Limestone Rates

THE INTERSTATE COMMERCE COMMISSION on June 5th held that railroad rates published by some 30 carriers applying to agricultural limestone from Tennessee to regions in Mississippi, Louisiana and Arkansas were unreasonable. It further held that the rates were preferential to producers of the same products in Krause, Ill., and Cedar Bluff, Ky., and ordered the carriers to revise the schedules by August 29, applying the basis of the rates used by the Illinois and Kentucky points to the rates in the regions which were held discriminated against. The Franklin Limestone Co., Inc., brought the charges in I. C. C. Docket 29263.

No Gravel Until OPA Grants Relief

UNDER a temporary arrangement made with OPA pending consideration of an application for price adjustment, the Medford Concrete Construction Co., P. R. Bateman and Son, and the Lininger Sand and Gravel Co., recently resumed sales of sand, gravel and crushed stone with a slight increase in prices. Sales were suspended May 4 because OPA refused to give price relief enabling the firms to operate at a reasonable profit.

Big Cement Contract

CALAVERAS CEMENT CO., San Francisco, Calif., has been awarded the contract for 72,000 bbl. of cement for Shasta and Keswick Dams at a total cost of $184,551. The Reclamation Bureau reported the cement will be used on work at the Shasta Power Plant, installation of spillway gates, completion of penstock facilities and other construction deferred during the War. At Keswick Dam, work will include concrete placement in the spillway section of the dam, relocation of a railroad and closing the present passageway in the dam for the rail line.

Open Quarry

WESTERMAN QUARRY on the west side of East Sound, Orcas Island, Wash., will be reopened after having been closed since the beginning of the War. Gordon Clauson will operate the quarry.

Start Ready Mix Plant

ELWOOD READY MIX CO., Elwood, Ind., opened up its modern ready mixed concrete plant on May 11. Robert Carter is owner and Harley Rominger is plant superintendent. The plant has a 200 cu. yd. Butler three- compartment bin which is fed aggregates from a track hopper by means of a 24-in. Atlas belt conveyor, 200 ft. centers. Bulk cement storage capacity is two carloads which is delivered to the steel silo by means of a screw conveyor from the track hopper to the boot of an enclosed bucket elevator.

New Alabama Cement Plant

THE IDEAL CEMENT CO., Denver, Colo., has announced the purchase from the government of the emergency bauxite extraction plant in Mobile, Ala., for the purpose of converting it into a cement manufacturing plant.

Build Crushing Plant

SPRINGFIELD SAND AND GRAVEL CO., Springfield, Ore., will start construction of a $100,000 crushed stone plant as soon as materials become available. The plant, for which most of the materials were purchased in January, will be located south of Springfield. Plant capacity will be about 700 cu. yd. a day.

Lehigh Wins Award

LEHIGH PORTLAND CEMENT CO., Metaline Falls, Wash., plant has received a contract for 125,000 bbl. of cement as one of the first contract awards for cement for the construction works of the Columbia basin project, United States Reclamation Service. Other awards for a total of 350,000 bbl. are to follow.

Form Gravel Concern

THE GATES SAND & GRAVEL CO., INC., has been incorporated to produce sand and gravel in a plant near Yakima, Wash. Associated with D. Gates in the company are Mr. and Mrs. C. B. Marx, former residents of Portland, Ore.

Minnesota's Cement Plant

FURTHER STEPS are being taken to carry out the Lehigh Portland Cement Company's plan to erect a cement plant near Monticello, Minn., utilizing the extensive marl deposits in surrounding lakes. Evidence was recently presented by the cement company in an application for a permit before Chester S. Wilson, commissioner of conservation to remove marl from the lake beds.

Sell Fluorspar Mill

HARRY M. WILLIAMSON AND SON, Denver, Colo., recently announced the sale of its Jamestown fluorspar mill to the Mahoning Mining Co., Rosiclare, Ill. The Mahoning company plans to produce 800 to 1000 tons of acid-grade fluorspar per month at the Jamestown mill. The Williamson interest will continue mining operations and furnish all the ore required by the new mill operators.

Buy Sand Company

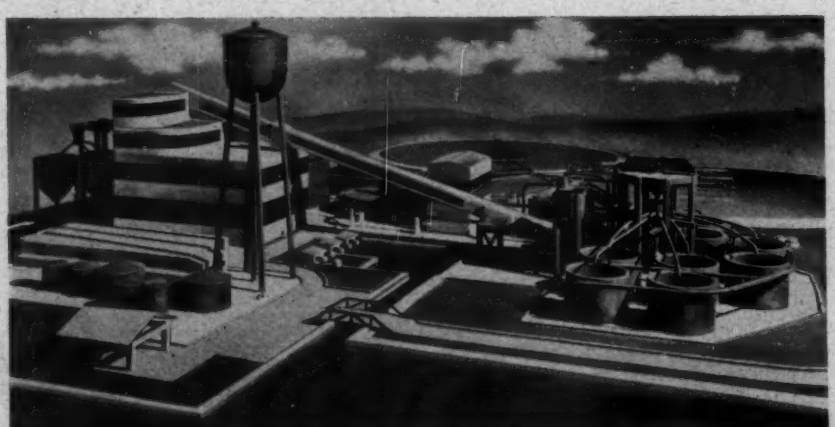
OGDENSBURG BRICK AND SAND CO., Ogdensburg, N. Y., has been sold to McConville, Inc., contractors. At one time the company made brick, but discontinued this part of the business to produce sand and gravel.

Enters Ready Mix Field

SNOHOMISH SAND AND GRAVEL CO., Snohomish, Wash., has announced that it will enter the ready mixed concrete business. Two 2-cu. yd. mixer trucks have been ordered.

Reopen Gravel Pit

M. C. LININGER AND SONS, Medford, Ore., have reopened a gravel pit three miles west of Central Point. The company crushes granite and produces sand and gravel aggregates.



Model of latest phosphate washer and flotation plant to be operated in Florida by the International Minerals & Chemical Corporation. Capacity will be 4,000 tons a day

COMING CONVENTIONS

American Chemical Society, Semi-Annual Meeting, Chicago Coliseum, Chicago, Ill., September 9-13, 1946.

American Institute of Mining and Metallurgical Engineers, 75th Anniversary Meeting, Waldorf-Astoria Hotel, New York, N. Y., September 6-18, 1946.

National Chemical Exposition, Chicago Coliseum, Chicago, Ill., September 10-14, 1946.

National Concrete Masonry Association, Convention and Exposition, Hotel Sherman, Chicago, Ill., week of February 17, 1947.

National Crushed Stone Association, Directors' Meeting, Hotel New Yorker, New York, N. Y., July 18, 1946; Agricultural Limestone Division, July 19, 1946.

National Crushed Stone Association, Annual Convention, Edgewater Beach Hotel, Chicago, Ill., January 27-29, 1947; Agricultural Limestone Division, January 30-31, 1947.

National Industrial Sand Association, Fall Meeting, Edgewater Beach Hotel, Chicago, Ill., October 24-25, 1946.

National Safety Congress and Exposition, Stevens Hotel, Chicago, Ill., October 7, 1946.

National Ready Mixed Concrete Association, Annual Meeting, Biltmore Hotel, Los Angeles, Calif., week of March 3, 1947.

National Sand and Gravel Association, Annual Convention, Biltmore Hotel, Los Angeles, Calif., week of March 3, 1947.

Midwest Agstone Meeting

THE ANNUAL MEETING of the Midwest Agricultural Limestone Institute was held in Springfield, Ill., on June 14 with E. J. Krause, president, presiding. Companies represented were as follows: Columbia Quarry Co., Consumers Co., Dolese & Shepard Co., Elmhurst-Chicago Stone Co., East St. Louis Stone Co., France Stone Co., Lehigh Stone Co., Lamar Stone Co., Pontiac Stone Co., National Stone Co., Newton County Stone Co.

Officers elected were as follows: E. J. Krause, president; W. N. Carter, vice-president; H. A. Clark, treasurer; and F. W. Mumma, secretary.

The meeting was well attended. In addition to the member representatives, A. T. Goldbeck, engineering director, National Crushed Stone Association, and J. E. Gray, were guests. Both Mr. Goldbeck and Mr. Gray discussed the subject of bituminous road construction at the afternoon session.

Open New Agstone Unit

THE KOEPKE SAND & GRAVEL CO., Appleton, Wis., has opened up a new agricultural limestone crushing plant in the Town of Trenton. The plant also will produce crushed rock for road surfacing, chips for top dressing roads and driveways. L. H. Koepke, president of the company, reports that eight portable plants are being operated by the company in Wisconsin. Road construction is the primary business of the company.

Strikes Close Plants

WITH the coal and railroad strikes past history, the cement industry and other rock products producers hope to get back into full production, but it is expected that plant shut-downs during this period will be reflected in definite shortages in certain areas until this Fall. Practically every cement plant depending upon coal for fuel had to shut down or seriously curtail operations. Trucks were used to make cement mill deliveries during the railroad strike, but such shipments were totally inadequate. Cement demand may reach a peak of 185,000,000 bbl., far in excess of the estimate early in the year. Strikes closed four cement plants in the Pacific Northwest.

Stone Plant Under Way

CAROLINAS' CEMENT AND LIME CO., near Harleyville, S. C., has announced that its new $300,000 limestone plant will be in production about July 1. This unit will produce agricultural limestone, fertilizer filler, aggregate for concrete block, and grit for poultry. It is the first unit of a project which eventually will be a $2,000,000 cement plant at the same site. Work on the cement plant has been held up due to inability to secure machinery. As previously reported in ROCK PRODUCTS, officers identified with the Volunteer Portland Cement Co., are identified with the new project.

Quarry Injunction

MAUMEE STONE CO., Toledo, Ohio, is fighting an injunction brought by property owners who contend that quarrying operations would create a nuisance and hazard and that property values would decrease.

Installs New Crusher

RUSSELL DODD, operating an agstone crushing plant south of Sturgeon, Mo., has installed a new crusher and feeder southwest of this city.

Exhibit of Hougland & Hardy, Inc., Evansville, Ind., at American Foundrymen's Association convention. The purpose of the exhibit was to show the great variety of sands available in different deposits of the company, and to illustrate mining, drying, milling and preparation of the finished product. Complete A. F. A. analyses also were displayed

Inspect Cement Plant

SOUTHWESTERN PORTLAND CEMENT Co., Osborn, Ohio recently invited 75 business men and public officials to attend an open house and inspection tour of the plant on the invitation of George E. Warren, vice-president and general manager of the company. Ernest V. Apt, sales manager, and J. E. Velzy, superintendent, headed the committee in charge of the open house.

Rock Wool Plant

ROCK PRODUCTS MANUFACTURING CORPORATION, Ada, Okla., a newly organized concern, has announced plans for the construction of a new rock wool plant. Stone for the rock wool plant will be obtained from deposits west of Troy, Okla., and a crushing plant will be located here.

Move Cement Sales Office

MANITOWOC PORTLAND CEMENT Co., Manitowoc, Wis., has moved its sales office to the Marquette Building in Milwaukee, according to Geo. P. Schwaab, sales manager. Heretofore the offices have been in the main offices of Manitowoc Ship Building Co.

Start Ready Mix Plant

TRANSIT MIX CEMENT Co., Hays, Kans., is the name of the new ready mixed concrete company which plans to start operation in the near future. Ralph Hunter, contractor, reports that the plant is now being built at Tenth and Milner streets.

Change Name

BUTLER & STICKNEY CONCRETE BLOCK Co., Murfreesboro, Tenn., is the new name of the former Butler & Steward Concrete Block Co. This change was made with the announcement by Henry K. Butler that he had purchased the interest of Kenneth Steward.

Block Plant Purchased

G. R. BATCHELLER and GEORGE PARDEN purchased the Sioux Concrete Products Co., Sioux City, Iowa, in March, 1946, and have incorporated under the name of Concrete Products Co. of Sioux City. Modernization of the plant includes construction of a concrete masonry unit building 70-x 100-ft. to house equipment. The Stearns Clipper Stripper now used will be augmented by a new No. 9 Stearns Joltcrete, six curing rooms will be built, and an Erickson power lift truck will be added. A hopper is being constructed under a spur track leading into the plant, and a bucket elevator and overhead bins will be installed for aggregates. Production is expected to reach 6000 units per day when the new plant is in full production in the late Summer.

In Block Business

UNITED SUPPLY CORPORATION, Virginia Beach, Va., is planning to set up a concrete block plant to supplement its hardware, paint and building supply business. Company officers are George D. Hartley, president; Lester B. Shelly, vice-president; and Robert Lee Simpson, secretary.

Grant Crusher Permit

THE MAUMEE STONE Co., Toledo, Ohio, has been granted a permit by the Maumee, Ohio, city council to build and operate a crushing plant and bituminous mixing unit.

Cover Picture

THIS month's cover picture, showing the agglomerate tabling and froth flotation section of the Peace Valley, Fla., phosphate plant of International Minerals and Chemical Corp., was selected, to tie in with the flotation series of articles beginning in this issue, because this flotation mill is one of the largest in the world from the standpoint of tonnage processed.

The separation made is silica from phosphate. Phosphate is floated from silica in the right hand bank of cells. Concentrates become the feed for the left hand bank of cells where silica is floated, reversing the process.

Starts Gravel Operation

J. C. BLUNK CONSTRUCTION Co., Ottumwa, Iowa, producer of ready mixed concrete, has opened a sand and gravel plant in this city known as the Iowa Sand and Gravel Co. According to D. J. Blunk, president, the plant will have a daily capacity of 600 tons, when all equipment is in place. A 35-acre area is worked, containing a 5-ft. stratum of sand and gravel in equal amounts. The deposit is excavated by a Sauerman drag line with a 1-cu. yd. bucket. Majority of production will be used at the ready mixed concrete plant.

Build Ready Mix Unit

ROCK ISLAND LUMBER Co., Great Bend, Kans., is building a ready mixed concrete plant which is estimated to cost about $50,000. It is hoped to have the superstructure up by August 1.

Change Name

THE PARAGON PLASTER Co., 300 W. Water street, Syracuse, N. Y., has changed its name to Paragon Supply, Inc.

Whitehead Bros., New York, N. Y., exhibit at American Foundrymen's Association convention. Word SAND showed colored pictures of different deposits of the company, on the back of which were lights operated to give the illusion of blowing sand

HINTS and HELPS

PRACTICAL IDEAS DEVELOPED BY OPERATING MEN

Grizzly Over Car

BELLAMY SAND AND GRAVEL CO., Correctionville, Iowa transports material from pit to plant in hopper-bottom railroad cars. To prevent oversize

Inverted V-shaped steel grizzly over top of car prevents entrance of large boulders

boulders from entering the car a steel-rail grizzly is placed in an inverted V position so that the oversize will drop off to the side while the smaller aggregates will pass through the grizzly into the cars as they are being loaded. The arrow in the accompanying illustration points to the grizzly on top of the car.

Wrench for Frozen Valves

By J. F. PRUYN

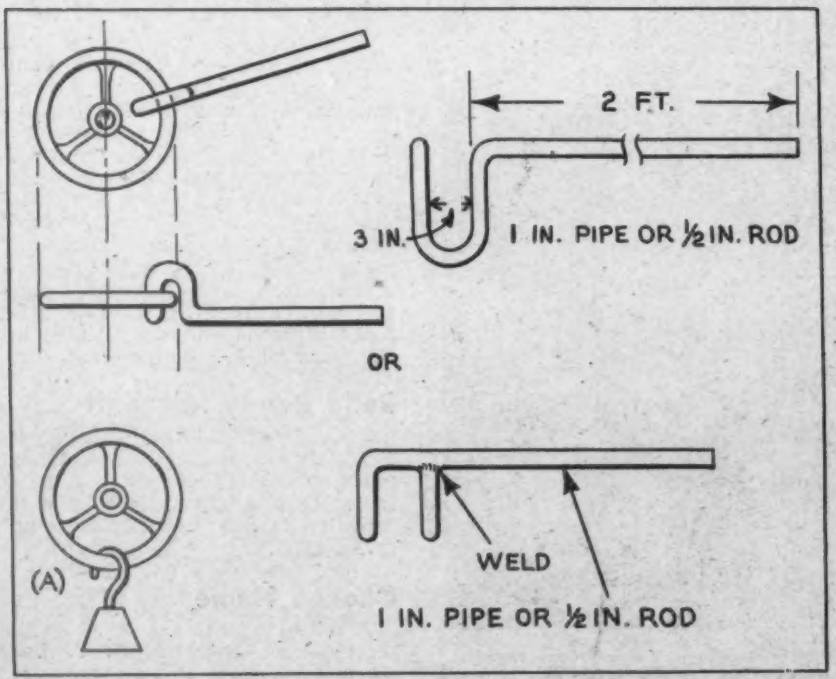
Two simply constructed wrenches, shown in the illustration, have saved time and energy where valves are out of reach, frozen or corroded. They can be made of pipe or bar of any diameter, depending on the size and leverage force needed. A valve (A) which vibrates open or closed can be held stationary by hooking a weight over the handle as shown in the sketch.

Two-Way Ramp

TRUCKS carrying aggregate from stockpiles at the Automatic Gravel Co., plant at Muscatine, Iowa, may discharge to railroad cars or to a belt conveyor for bin loading, over the same ramp. As shown in the illustration, discharge can be to a hopper

Trucks may dump from ramp to conveyor belt hopper or to railroad freight cars by means of hinged chute, to the right

over the belt conveyor at the left, or to cars through the movable chute at the right. The chute, fastened by cables for raising or lowering, can be lowered into the cars to guide the aggregate from trucks to cars.



Two shop-made wrenches to loosen corroded valves

Prevent Spillage

IDEAL SAND AND GRAVEL CO., Mason City, Iowa moves sand and gravel from pit to plant by truck and railroad car. Both discharge the load to an under-track hopper through an opening between the tracks. Since the width of the discharge gate on the trucks is greater than the opening between the tracks, movable plates have been installed to act as a funnel, diverting the flow to the center of the opening, and preventing spillage outside the tracks. The plates, one on each side of the track, are swung through an arc to place them in position for the trucks. When railroad cars bring in the aggregate or when the trucks wish to move over the platform, the plates are swung out of the way.

Above: Plates in position permitting trucks to dump into track hopper without spillage. Below: Plates swung away to allow cars to unload or for trucks to move over platform

Domestic Sillimanite

U. S. BUREAU OF MINES has confirmed the value of a new domestic source of Sillimanite for use in the production of refractory brick. According to Dr. R. R. Sayers, Director of the Bureau, the deposits, comprising a belt 30 miles wide and 250 miles long in Georgia and South Carolina, can be successfully treated by recognized mineral-dressing methods and the concentrate made into a superior product. The Bureau tested the concentrate in standard-size brick, and found that it met both the A.S.T.M. and the Navy reheat-test specifications for superduty refractories.

Dewatering System

FLINT CRUSHED GRAVEL CO., Des Moines, Iowa, has installed a semi-portable dewatering plant near the pit to reclaim solids for movement to the main plant for processing. A 10-in. pump in the pit sends the pulp up to the top of the dewatering plant where it is received in a discarded pump shell that breaks the velocity of the flow and distributes it over a steel apron, 4½-ft. wide and 20-ft. long, set at an angle of 1-in. per ft. The product passing over the apron discharges into a vertical chute, the

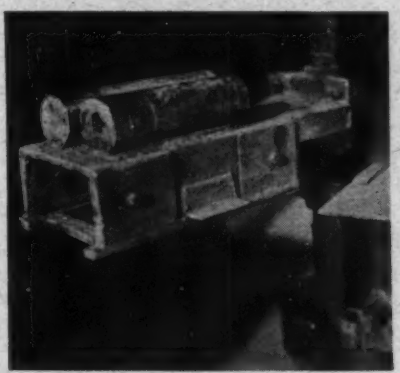
Showing how sand and gravel is recovered and dewatered in settling tanks from which it is discharged to narrow gauge cars for transportation to the plant

full width of the apron, and extending downward to a distance of about 8-in. below water level in the settling tank below. Solids settle in the tank and overflow is carried back to the pit by flume. When it is desired to reclaim more fines in the tank, a board is placed across the overflow end, thus raising the point of discharge and holding more pulp in the tank. Two manually-controlled discharge gates in the bottom of the tank send the dewatered material into a surge bin below where it is stored before discharge to narrow gauge cars.

Reconvert Block Machine

SELMA CONCRETE PRODUCTS CO., Selma, Ala., producing concrete masonry units on a reconverted machine, have made the mold box 1 in. deeper and press the block as it is being vibrated, the plate pressing the block to the normal 8-in. size. The plate, with a weight of about 80 lb. welded on top, is the exact size of the mold box and descends one inch

Presshead for reconverted block machine in off-bearing position. Note 80-lb. weight comprising two steel bars. Head is swung over mold box to compact block



Presshead, which swings over mold box, acts as an impact unit while block is being vibrated

into it, thus giving greater density to the block as it compresses. Flanges on the plate prevent it from going deeper than the 1 in. required. The plate swings on an arm attached to a vertical shaft, and can be lifted by a foot pedal convenient to the operator. As soon as the mold box is filled with concrete, the plate is swung over the mold box and pressed down on the block as it is being vibrated. The weight of the plate alone is sufficient to thoroughly compact the unit to the standard size. After vibration, the plate is swung back to a position out of the way so that the block can be removed.

Feed Water for Boilers Should Be Clean

IMPORTANCE of complete elimination of all organic and inorganic solids from water for high-pressure steam boilers was emphasized by Sheppard T. Powell, Baltimore, Md., consulting engineer, in a recent paper before the American Society of Civil Engineers. Even traces of silica may be objectionable under certain operating conditions. Softening of water to remove hardness is justified when the hardness of water exceeds 80 to 85 parts per million.

Truck-Mounted Conveyor

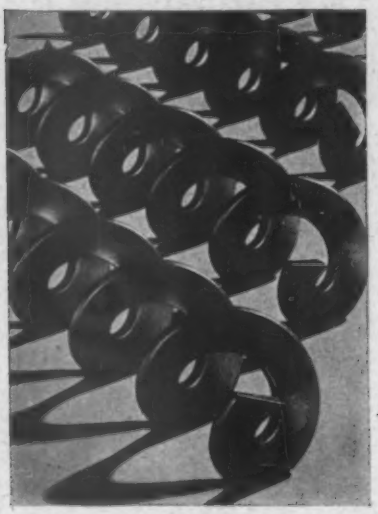
FARMINGTON GRAVEL CO., Farmington, Iowa, producing sand and gravel with a small portable plant, has mounted a short, inclined belt conveyor on an old truck chassis so that it can be quickly moved from one location to another. Aggregates discharge from the portable plant to the portable conveyor for stockpiling which permits movement when one stockpile is built up and a new one is to be started. The 18-in. belt, 30 ft. centers, is secured at the lower end to the front of the truck chassis, and the upper end is held in place by steel tubing welded to the frame, as shown in the accompanying illustration. On top of the framework is a pulley, through which a cable is run, connected to the discharge end of the conveyor and to the front of the truck. This permits vertical movement of the conveyor so that it may be raised when the stockpile is being built up.

Portable belt conveyor mounted on truck chassis. Conveyor belt may be raised or lowered by means of cable and pulley

New MACHINERY

Welded Conveyor Screw

LEE SPRING Co., New York, N. Y., is offering a new type of conveyor screw. Since the blades of conveyor screws are subject to maximum wear



Conveyor screw made by welding blade to a steel shaft

and have to be replaced periodically, substantial savings are said to be effected by welding the blade to the shaft. This company is offering blades, formed from a ribbon of steel, in carbon, stainless and alloy steels, bronze and other materals.

The conveyor screw, made this way, consists of a band of steel, wound edgewise and pitched to form a helix. It is said to reduce weight, has great strength, and costs less.

Small Shovel

THE BYERS MACHINE Co., Ravenna, Ohio, has announced a light, fast ⅜-cu. yd. excavator, known as the 'Junior," which is said to have several partial swing operating advantages. It weighs 8¾ tons complete which gives it portability in moving from job to job. A 37.5-hp. industrial type motor provides ample power to force the ⅜-cu. yd. dipper through hard digging.

Excavator operator and all working machinery are located on the non-weaving 14-in. deep structural main frame, and do not swing with the boom. A low center of gravity is achieved because gears, clutches, drums and shafting are set low on the main frame. Other features include fully enclosed cab, new dipper trip, worm and gear boom hoist, and oversize clutches all of the same size with interchangeable linings and self-cleaning crawler treads.

Light ⅜-cu. yd. excavator with low center of gravity

Bronze Welding Rod

THE LINDE AIR PRODUCTS Co., New York, N. Y., has developed a patented flux-coated bronze welding rod for application by the oxy-acetylene process which is known as Oxeld No. 25M. When the rod is made, it is precoated with Brazo flux in proper proportion to its size. This flux adheres firmly to the rod, melting down into the molten puddle without burning off ahead of the rod.

Electronic Feed Control

THE GAI-TRONIC CORPORATION, Washington, D. C., has announced an electronic, mill feed control. Gai-Trol, as it is known, is designed to improve the efficiency, output and performance of tube, ball, bowl and other types of grinding mills.

This control equipment consists essentially of a load detector external to the mill and connected directly to the electronic equipment which is contained in a 66-in high floor-mounted, self-supporting steel cabinet. A circuit from the electronic equipment supplies a variable speed, direct-current, feeder drive motor.

The circuit between the load detector and the feeder is direct and entirely electronic; no moving parts or mechanical speed change equip-

Electronic feed control equipment mounted in cabinet

ment is involved. The speed of the feed motor is controlled precisely and continuously throughout a stepless range and without lag, cycling, intermittent action or over and under "hunting."

Stationary Gas Turbine

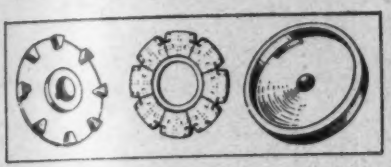
ALLIS-CHALMERS MANUFACTURING Co., Milwaukee, Wis., has announced that the first large stationary gas turbine ever to generate power with a gas temperature as high as 1350 deg. F., is undergoing tests at the Naval Experiment Station at Annapolis, Md.

Operating under progressively increasing gas temperatures, this Allis-Chalmers experimental gas turbine will be run at an eventual maximum of 1500 degrees. The gas turbine, which operates much the same as a steam turbine, except that it uses hot air instead of steam to spin turbine blades, is said to have many advantages over the steam turbine. Less space is required as boilers, condensers, and complicated steam lines are not needed.

Automatic Clutch

HARDINGE CO., INC., York, Penn., has secured the manufacturing and sales rights for the BLM "Auto-Centri" clutch from the Automatic Clutch Corporation of Canada, subsidiary of the British Meter Co.

This automatic clutch is said to have many drive applications in the



Automatic clutch with drive body to the left, driving mechanism in the center, and driven body to the right

rock products field; such as, ball mills, conveyors, elevators, fan drives, internal combustion engines, pulverizers, crushers, and pumps.

When installed with an electric motor drive, a standard squirrel cage motor with across-the-line starting equipment can be used in place of a slip-ring or high-starting torque squirrel cage motor with expensive starting equipment. As the motor approaches full-load speed and maximum torque, the clutch picks up the load gradually, eliminating shock loads. On drives using internal combustion motors, the clutch will automatically disengage the load when the motor is throttled to idling speed.

There are three main elements; a driving hub, the driven hub, and driving mechanism. Sectional liners on the drive body can be replaced through a slot in the driven hub without removing any parts of the clutch. The drive body is keyed to the shaft of the power unit, and the driven body is keyed to the shaft of the driven machine. The driving mechanism is composed of a number of metal blocks fitted so as to form an expansion ring. The drive to the load is always entirely disconnected at starting. As the drive shaft gains speed, the driving member expands outward, and the increasing centrifugal force is applied smoothly and evenly on the friction lining which is in contact with the friction wall of the driven body.

Safe Cargo Hook

AMERICAN CHAIN LADDER CO., New York, N. Y., designed a safety cargo hook for the Navy to handle simultaneously three cargo nets with a total load of 3500 lbs. This hook is now available for application to peace-time hoist and loading problems. It is made with a grab opening of 3-7/16 in., while the diameter of the bail opening is 4-1/16 in. Ample provision has been made for overloads as tests show the hook will tolerate loads exceeding 25,000 lbs.

The company also has announced new shank and shackle models. The new shackle hoist hook includes its own shackle, making an initial shackle unnecessary in threading the thimble.

Installation of proportioner in ready mixed concrete plant. Proportioner is mounted on the scale beam housing with the discharge pipe below valve leading to sand in weigh hopper

Air-Entraining Agent Meter

DEWEY AND ALMY CHEMICAL CO., Cambridge, Mass., has designed a meter or proportioner, as it has been termed, for accurately and quickly measuring Darex AEA air-entraining solution into the concrete mix.

It is essentially a container so arranged with a two-way valve that the solution flows from a drum, mounted above the container, to fill the container completely and to fill the vent pipe up to the level of liquid in the drum. Upon turning the two-way valve, the liquid then discharges from the vent pipe and container to the concrete mixer. The amount discharged is determined by the position of the swing pipe in the container. This position is variable, and is controlled by the dialed and calibrated quadrant shown in the illustrations.

Close-up of proportioner, which can be calibrated in ounces or milliliters

In the illustrations may be seen an installation in a ready mixed concrete plant. The proportioner is mounted on the scale beam housing where it is handy for the operator. The discharge pipe below the valve leads to the sand in the weigh hopper. In other plants, the discharge pipe is hooked into the water pipe so that the Darex AEA is carried into the batch with the mixing water. Either hook-up is entirely satisfactory.

To check the functioning of the proportioner, a short length of lucite tubing directly above the container in the vent pipe permits visual inspection to determine that the container is filled, and a break in the discharge line with a funnel provides for checking on the discharge of the proportioner.

Before operation it is necessary to calibrate the proportioner to determine the volume of Darex AEA obtained at each setting on the quadrant. This is done by filling the proportioner and then discharging it into a graduated receptacle, preferably a 1000 ml. chemical graduate. By getting the quantities discharged at 4 or 5 settings on the quadrant, it is possible to draw a curve plotting quantities against the number of notches on the quadrant setting. The dial may be marked with the number of notches and the setting determined for any required quantity of air-entraining agent by reference to the curve or a table or the dial may be marked in quantities directly. If a chemical graduate is used and it is desired to note the quantities in fluid ounces, this may be done by converting milliliters to fluid ounces; 29.3 ml. or 29.3 cu. cm. are equivalent to one fluid ounce.

DIESEL-ELECTRIC Units Operate Crushing Plant

Sours Quarries, Carlisle, Pennsylvania, modernizes quarry haulage, adds crushing capacity, and converts to Diesel-electric power

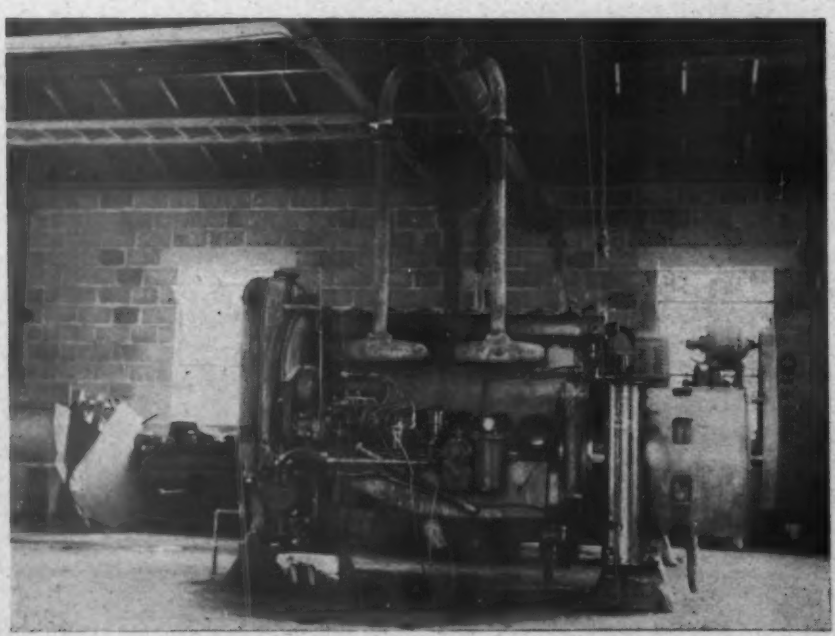
P. C. Sours, manager, standing next to one of the seven modern dump trucks operated by the company

BY MODERNIZING haulage from the quarry to the primary crusher and installing a positive feeder at the crusher to eliminate "feast and famine" operation at this point, the Sours Quarries, Carlisle, Penn., increased production from approximately 110 t.p.h. to 150 t.p.h. along with a reduction in operating costs. The increased crusher "make" in turn called for modern secondary crushers to handle the added volume and meet the post-war demand for a greater variety of sizes. This company produces road stone, chips, and concrete aggregates.

A Koehring heavy-duty Dumptor carrying a 9-ton payload replaced the two standard end dump trucks formerly used to haul rock from quarry to crusher. The Dumptor makes a round trip, including loading and unloading, in 2½ minutes. The same operation over the same distance (100 to 150 cu. yd.) with standard trucks required twice as long per truck, each of which carried a maximum load of four to six tons. Equal speed backwards and forwards, making for greater mobility in spotting and dumping, is one of the features characterizing Dumptor performance.

P. C. Sours, manager, also pointed out an important difference in fuel consumption. A Dumptor powered by a 4-cylinder G. M. Diesel, rated at 107 b.hp., consumes one gallon of fuel oil per hour. At a cost of 8c per gal., the cost for a 9-hr. day is 72c. The two trucks on the other hand required a combined total of 60 gal. of gasoline which at 15c per gal. brought the fuel cost to $9 for one operating day. Comparing the two methods on the basis of payload hauled shows an even greater disparity of costs.

As mentioned earlier, a positive feeder was installed at the primary breaker, to replace the undesirable feeding conditions when using a tilting platform. The new installation is a 36-in. by 18-ft. long Traylor heavy-duty apron feeder. The greater uniformity in feeding the crusher manifests itself in the form of increased crushing capacity, and hence production throughout the entire plant.



One of two 200-hp. Diesel-electric installations which furnish power for nearly all operations

Quarry Operations

A brief outline of the operation from quarry to bins is as follows: Preparatory drilling for primary blasting is done with a Keystone well drill making 6-in. holes. The usual practice is to make a 9-hole shot bringing down about 18,000 tons; however, 4-and 6-hole shots are also made under certain conditions which are good for 6000 or 7000 tons. Jackhammers are used in secondary blasting.

Three 1¼-cu. yd. Model GA2 Bucyrus-Erie gas shovels are in service around the plant, one of them for Dumptor loading, one for stockpile recovery and one for general utility.

Crushing and Screening

A 40-x 42-in. Allis-Chalmers Blake jaw crusher takes the quarry feed, discharging to a 30-in. inclined belt conveyor, 160 ft. centers, which delivers to a 5-x 10-ft. Telsmith vibrating scalper. The top deck has 2½-in. and the bottom deck ¼-in. square openings. Top deck rejects are the feed for a 13-B Telsmith gyratory, the throughs of which join the 2½-x ¼-in. stone off the bottom deck, at the boot of a 24-in. bucket elevator. This elevator takes the combined product to a 48-in. diameter by 22-ft. long revolving screen with round perforations grading from ¼ in. in size at the feed end to 4 in. at the discharge end. Six dividing plates make it possible to take off any combination of size separately. The usual practice is to top off the ¼-in. screenings, largely created in the Telsmith gyratory, and adding them to the screenings passing the lower deck of the scalper, to be used in the making of water-bound macadam.

The sizes larger than ¼-in. and

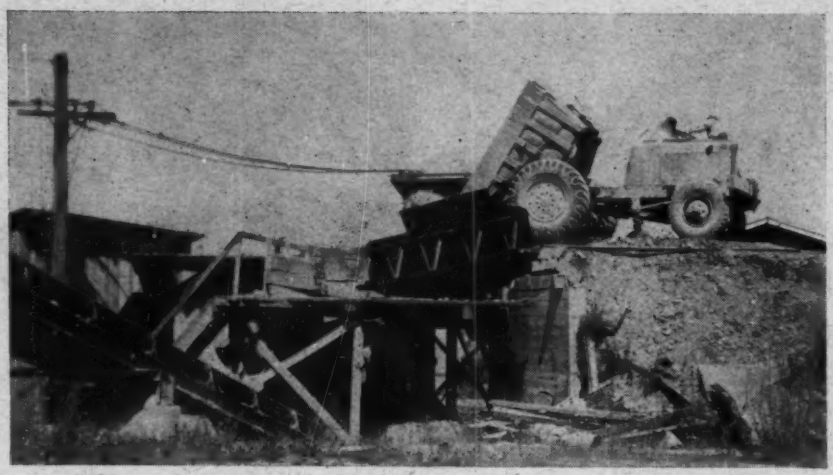
under 2½-in. are crushed in a 3-ft. Gyrasphere, but the rejects represent a circulating load which is returned to the 13-B Telsmith to repeat the cycle first described.

Throughs from the Gyrasphere are chuted to a pair of 3-x 6-ft., 2-deck, Good Roads vibrating screens operated in series, with the top deck rejects of the first becoming the top deck feed of the second. The cloth openings of the first screen are 9/16-in. and 3/16-in. for upper and lower decks, respectively, while the cloth openings for the second screen are 1¼-in. and ⅞-in. for the corresponding decks. The 9/16-x 3/16-in. stone becomes 1-B gravel while the ¼-in. screenings join those made earlier in the flowsheet.

Four sizes can be made on the second screen; viz., 2½-x 1¼-in., 1¼-x ⅞-in., 1¼-x 9/16-in., and minus ⅞-in. The 1¼-x 9/16-in., or 2-B aggregate is made by installing a solid plate under the lower deck cloth. Storage of the various sizes is in six 70-ton bins for gravity feed to truck or rail.

The crushing plant which prior to 1940 purchased its power, now produces its own, the entire requirements being furnished by two 200-hp., ME-650, supercharged Murphy Diesels, separately hooked up to a pair of 125-kva. Electric Machinery Co. generators, delivering current at 440 volts. Individual drives are used throughout.

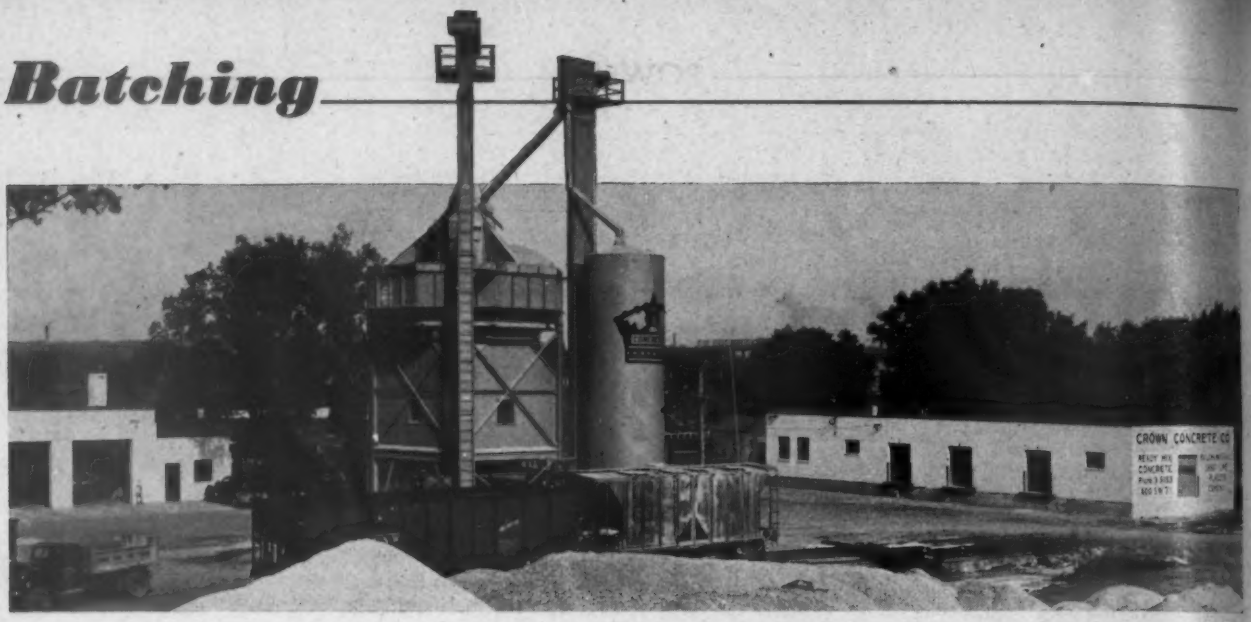
The plant is owned by J. F. Sours. P. C. Sours is the manager.



Dumptor unit of 9-ton capacity unloading into primary crusher feeder. Belt conveyor takes crusher product to screening plant

View of crushing and screen plant. Note interesting truss steel support for conveyor belt structure

Left: Gyratory crusher installation with 24-in. bucket elevator to deliver crusher product to revolving screens. Right: Installation of Gyrasphere crusher with bucket elevator to the left to carry crusher product to vibrating screens above bins



Ready mixed concrete batching plant may be seen in the center; warehouse and office building to the right; and garage and shop, to the left

ACCURATE and RAPID
Proportioning of Ready Mixed Concrete

By H. E. SWANSON

THE new ready mixed concrete plant of the Crown Concrete Co., Des Moines, Iowa., combines the best features of a number of operations throughout the Midwest visited by R. V. Roupe, president, in preliminary planning.

Placed in operation in April, 1946, the plant was designed by the C. S. Johnson Co., and comprises newly-developed equipment and devices developed for accurate batching and all-round operating efficiency. Briefly, the batching plant consists of a five-compartment Octobin with a total capacity of 323 tons; an 833-bbl. bulk cement silo; a 260-bbl. capacity central working bin for bulk cement; individual weigh batchers for aggregates and cement; and a 520-gal. water storage tank above a 250-gal. batching tank. Provision has been made to heat aggregates and water for cold weather operation, and a pozzolith dispensing system has been installed to serve customers desiring plasticized concrete. Push-button control features the water and cement batching system, with automatic shutoff to govern accurately the amount to be placed in the concrete mix. Bulk cement bins in the batching plant and the bulk cement storage silo are equipped with electrical devices to signal when bins and silo are full.

Sand, gravel and crushed limestone aggregates are received by rail from the Coon Valley Gravel Co. and Douds Quarries Co., both affiliates of the Crown Concrete Co. Aggregates are discharged from bottom-dump cars through a grizzly to a 10-cu. yd. capacity under-track hopper. In addition to sending aggregrates to the storage bins, provision has been made to stockpile several types of aggregate in the adjacent 160-x 300-ft. storage area, where several thousand tons of aggregates can be accommodated. Stockpiling will be handled by a crane, yet to be purchased. Aggregates may also be sent into the hopper by trucks.

From the under-track hopper, aggregates are carried by a 20-in. inclined belt conveyor, 22 ft. centers, for discharge to the boot of an enclosed chain-driven bucket elevator, 75 ft. high, at a rate of 110 tons per hour.

Discharge from the elevator is into a swivel chute, operated by cables and a selector wheel at ground level. This chute guides aggregates into the desired compartments of a five-compartment Johnson Octobin having a total capacity for 323 tons.

Bulk Cement

Bulk cement is carried from an under-track hopper by screw conveyor, 25 ft. long, to a bucket elevator, 73 ft. high. At the top of the elevator is a flop-gate, controlled by levers and cables from ground level, sending the cement into a two-compartment, 833-bbl. capacity storage silo, or into a two-compartment, 260-bbl. capacity working bin centrally located between the aggregate compartments. There are three control levers, one directing the flow to the silo or the working bin, the second sending the feed into either of the two compartments in the silo, and the third governing the flow to the two compartments in the working bin. Normal portland cement and high-early-strength cement are stored. Electrical contacts in both the silo and the working bin indicate when the bins are full by flashing a light and ringing a bell at the operator's floor. Cement sent from the bin into the cement weigh-batcher is accurately weighed, and has an automatic shut-off, governed by a solenoid switch.

Water Measurement

Aggregates are weighed in a separate batcher equipped with a 5-

beam scale, and measurement is manually-controlled. Water measurement is automatic, employing the same method used for cement.

Water, received from the city supply, is sent to a 520-gal. tank through a 3-in. pipe. When full, the water is shut off by a float valve in the tank. Under this tank is a 250-gal. measuring tank controlled by a solenoid switch to accurately weigh out the proper amount of water. Under the tank, and not connected to it in any way, but fastened to the floor underneath, is a small box, into which the water is discharged. Thus the water weighing tank rides free on the scales with no connections to the smaller tank to disturb the accuracy of measurement. When the proper amount of water has been obtained it is drained into the collecting box underneath. From the box, water is sent into transit mixers through a 6-in. pipe.

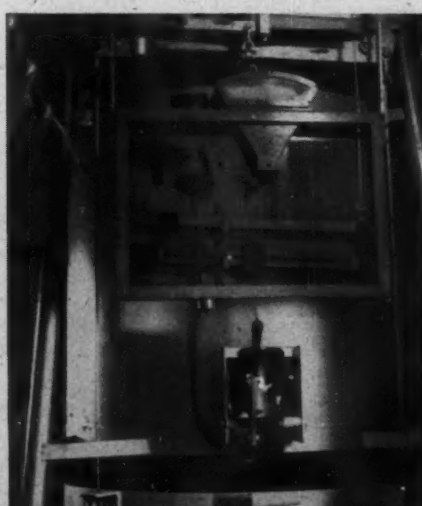
To permit the operator to see into the transit mixers underneath, 2-ft. square holes have been cut in the floor and covered with 2-in. thick glass.

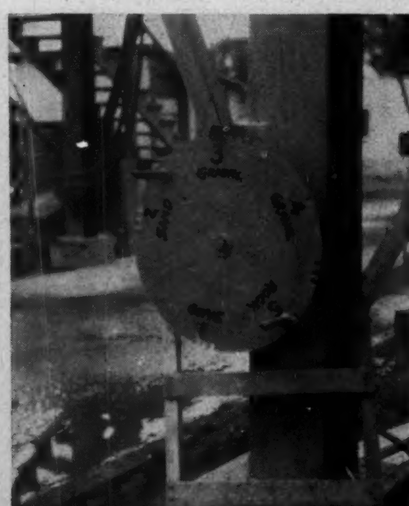
[illegible] new plant features an All-steel, 5-compartment aggregate bin, bulk cement, and electrical controls for cement and water measurement. Note swivel chute for distribution of aggregates

Heating Aggregates

When concrete is produced in freezing weather, provision has been made to heat aggregates and water. Steam is generated by a 100-hp. horizontal Kewanee boiler that provides live steam at 80 p.s.i. through ¾-in. pipes projecting into the aggregate compartment, each compartment being equipped with two jet entrances. It also will be used to heat aggregates received in cars, and to clean truck mixers. Water in the larger tank is also heated by steam.

To proportion plasticized concrete, which involves admixture with pozzolith, a system of dispensing the agent has been installed. Located at ground level, in the building housing the boiler, are two 480-gal. tanks in which the pozzolith is mixed. The liquid admixture is carried to a dispensing tank through a 1½-in. pipe by a small pump, where automatic control starts and stops the motor driving the pump. The dial on the equipment is set to correspond with





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the quantity of cement used in the batch. When delivery of the pozzolith solution is desired, the operator pushes an electric button which opens a solenoid valve thereby delivering the desired amount of solution. After delivery is made, a time delay switch automatically starts a pump which fills the dispenser with pozzolith solution. When the dispenser is full the excess overflows, tripping a mercury switch and stopping the motor. The liquid pozzolith acts as a plasticizing and deflocculating agent to impart in concrete a greater resistance to wear and weather. This plant uses 0.9 lb. of pozzolith per bag of cement.

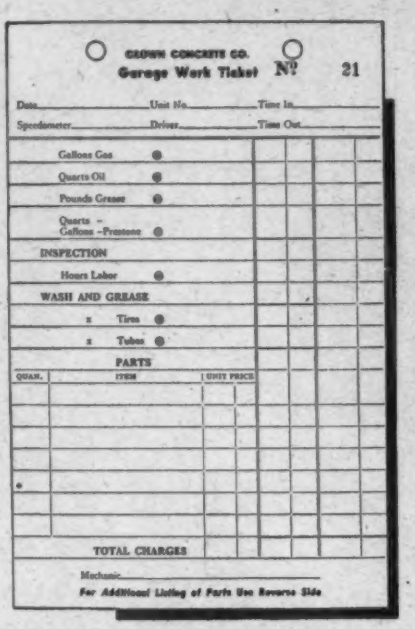
Transit Mix

Mixing is done in a fleet of 10 new Jaeger transit mixers, mounted on 1946 heavy-duty Dodge and Studebaker trucks. Dodge trucks are equipped with Eaton two-speed axles to give 10 speeds forward and two reverse. Six 2-cu. yd. mixers are mounted on the Dodge trucks, and four 3-cu. yd. mixers are mounted on the 6-wheel drive Studebaker trucks. Mixers, all the high-discharge type, are equipped with pressure grease guns mounted on the rear of the frame, so that the driver can give the drum gear a shot of grease when the mixer is discharging. A seal around the ring prevents the spillage of grease that is evident in so many of the older types of mixers. In addition to the fleet of transit mixers, there are three Dodge trucks with 3-cu. yd. dump bodies for the delivery of sand and gravel aggregates, and also, in certain cases, ready-mixed concrete.

Plant Design

Immediately adjacent to the plant is the dispatcher's office, with a full view of the driveway in and out of the yard. Empty trucks entering the yard find that the next load is waiting as soon as the trucks pull under the plant, since the dispatcher has relayed the order to the batching floor as soon as the truck entered the yard. Orders are relayed on a Flash-A-Call system, with combination transmitter-receivers located in the main office, the batching floor, the dispatcher's office, in the yard, and in the garage.

Among the modern features at this plant is the dual control of cement and aggregate delivery to bins. Located at ground level, where materials are received, are two switches, one controlling the cement handling machinery, and the other controlling the aggregate handling machinery. Similar switches are located at the batching floor so that movement of cement or aggregates can be started or stopped at the two locations. To prevent bulk cement from holding up in the bin, silo, or railroad cars, provision has been made to introduce compressed air into the silo and bin through jets, and through a special hose that can be placed into the bulk cement car. Air is sent through ½-in. hose by a small compressor at a low pressure, just enough to keep the cement agitated. Each air line is controlled by a separate valve.



CROWN CONCRETE CO.
Garage Work Ticket No. 21

Date _____ Unit No. _____ Time In _____
Speedometer _____ Driver _____ Time Out _____

Gallons Gas	●					
Quarts Oil	●					
Pounds Grease	●					
Quarts – Gallons – Prestone	●					
INSPECTION						
Hours Labor	●					
WASH AND GREASE						
x Tires	●					
x Tubes	●					
PARTS						
QUAN.	ITEM	UNIT PRICE				
TOTAL CHARGES						

Mechanic _____
For Additional Listing of Parts Use Reverse Side

Garage work ticket which permits a close check on mixer truck maintenance costs

A complete system of accounting has been set up that will enable the company to determine at any time exactly how much each truck has cost in delivering a cubic yard of concrete. Maintenance, repairs, gas, oil, and any other charge made to each truck is kept on file, as well as the number of miles that the truck has been driven and the total amount of concrete it has delivered. Shop records are kept on each truck showing when the truck was in the garage, speedometer reading, the driver's name, and what was done to the truck. Illustrated herein is a sample Garage Work Ticket that shows the detail to which this system is worked out. Each night, truck drivers are allotted an extra half hour to clean out mixer drums, and clean the truck. One man is hired for the sole purpose of checking each truck after the day's run, gassing and greasing it when necessary. His time as well as the driver's time is also charged against the truck.

Mixes Designated by Number

Since a number of different types of mixes are produced, a system has been devised whereby each type of mix is designated by a special number identifying it according to strength, aggregate, and cement. Four different coarse aggregates, three types of cement, and varying strength qualifications necessarily make a large number of different types of concrete. The table reproduced below has been devised to simplify identification of the mixes.

The first digit in the table represents the compressive strength, the second digit represents the type of coarse aggregate, and the third digit represents the type of cement.

This table is carried on in the same manner up to and including a compressive strength of 3500 lb. in increments of 500 lb. Thus, the number 341 appearing on an order ticket would signify a compressive strength of 3000 p.s.i.; crushed limestone as the coarse aggregate; and high-early-strength cement.

Copies of this table are kept in the main office, at the batching floor, and at the dispatcher's office.

Delivery Zones

There are two city zones, with prices established for the various types of concrete, as well as prices for delivery outside the city. Zone No. 1 constitutes an area within a 15-mile radius of the plant, and Zone No. 2 is the area within the city but outside Zone No. 1. The price for concrete delivered to Zone No. 2 is 25c per cu. yd. higher than that delivered in Zone No. 1, and the price for delivery outside the city is 25c per cu. yd. per mile greater than for delivery in Zone No. 2.

Balance of Plant Area

The 300-ft. square area on which the plant is set up also contains the main office, a warehouse, and a garage. Future plans include the addition of a 12-truck garage for housing the mobile equipment. The present garage, provided to maintain and repair equipment, is 52-x 54-ft., and contains a grease pit with underfloor lighting. Also housed in this building are locker rooms for the employes, showers, toilets, and in-

(Continued on page 98)

Strength lbs.	Mix No.	Type	With HES Cement Added Mix No.	With Pozzolith Added Mix No.
2000	11	Fine gravel	111	112
	12	Mixed gravel	121	122
	13	Coarse gravel	131	132
	14	Crushed limestone	141	142
2500	21	Fine gravel	211	212
	22	Mixed gravel	221	222
	23	Coarse gravel	231	232
	24	Crushed limestone	241	242

FROTH FLOTATION

Keystone to the spectacular development of industrial minerals

By JAMES A. BARR, Jr.

James A. Barr, Jr.

FROTH FLOTATION, in this period during which we are so rapidly depleting our priceless high grade mineral reserves, is without question destined to play a leading role in maintaining the ever-increasing flow of mineral concentrates from our mines to the finished product industries.

More than ever that last increase in concentrate grade and that last increase in mineral recovery are dependent on the Flotation Engineer, the ore dressing specialist, who relies on air bubbles to selectively separate valuable minerals out of low grade ores or mill waste.

Just what is meant by "froth flotation?" To define this method for separating minerals by expounding any one of the several plausible or carefully postulated theories makes the process very difficult to understand without painstaking study of the physico-chemical phenomena related to surface chemistry. Therefore, until we have methods for accurately measuring the physical and chemical behavior of such thin surfaces and further proof of the postulates it is best to simplify the definition.

Froth flotation as applied to the industrial minerals is dependent on that property of mineral matter which makes it possible to selectively wet or film mineral surfaces with an organic acid or an organic ammonia to produce a hydro-phobic film—a surface which is non-wettable by the liquid in which the mineral particles are suspended.

The froth flotation process consists of a method for suspending the selectively filmed mineral in an agitated liquid and introducing diffused air bubbles which attach themselves to the non-wettable organic surface film. As soon as enough bubbles attach themselves to a filmed mineral particle the apparent specific gravity of the mineral particle becomes less than the specific gravity of the suspending liquid. Then the particles rise to the surface and are held in the froth zone until they are wiped off by the rotating paddles into concentrate launders. The mineral or minerals which are not filmed by the organic substance continue to be water wettable and therefore pass through the agitated flotation cells to be rejected as waste gangue minerals—usually spoken of as tailings.

In modern concentrating practice it is sometimes difficult to differentiate between the terms concentrate and tailings, especially since more recent developments in froth flotation processing make use of the organic ammonias to float siliceous minerals which are, in many instances, the unwanted or gangue minerals. For this reason the terms "underflow" and "overflow" are sometimes more significant.

Mechanical features of froth flotation consist briefly of grinding to liberate the minerals, de-sliming or

The Author

• This is the introduction to a series of articles on froth flotation of non-metallic minerals by James A. Barr, Jr., who, in subsequent articles, will discuss plant layout, machinery and equipment, reagents and the actual separations of specific minerals by froth flotation.

Mr. Barr is the son of James A. Barr, Sr., chief engineer of International Minerals and Chemical Corporation—in order to distinguish between two men closely identified with the flotation process—and is research engineer in direct charge of the Flotation Department, Armour & Co., Chemical Division, Applied Research Laboratories, with headquarters in Chicago. He is consulting metallurgist, director of technical service and of experimental and development investigations in this capacity.

Educated in chemical engineering at Vanderbilt University and at the University of Minnesota, the author has had varied experience in all manner of flotation plants and related processing, as engineering consultant, metallurgist, operating director and designer of plants. His early experience was in prospecting for phosphate and as flotation operator in the Mt. Pleasant, Tenn. (his birthplace) and Florida fields. As sales engineer and as research and development engineer for Kalvin, Inc., Spruce Pine, N. C., Mr. Barr was manager of mining and processing developer of flotation processes for the recovery of by-products from mill (kaolin) wastes.

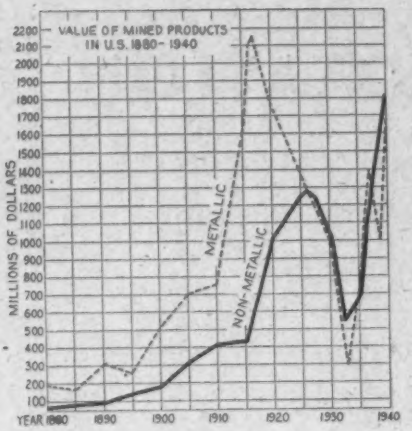
Later he operated his own company, as mining engineer and consulting metallurgist, in the development of underground and hard rock mines and in the development and operation of mica processing. Then he was metallurgist and superintendent of the mine and mill for Yadkin Valley Ilmenite Co., a division of Glidden Co., where he converted a tabling plant to a flotation mill and trained operating personnel. Later, as senior research metallurgical engineer of the Phosphate Division Research Laboratories, Peace Valley Mine, International Minerals and Chemical Corp., Mr. Barr conducted metallurgical surveys of the flotation mill, constructed an ore dressing laboratory and instructed operating personnel. Before coming with Armour, as consulting engineer for Pumice Corp. of America, Grants, N. M., he completed a metallurgical survey of the mine and mill.

In his present capacity Mr. Barr spends much time in the field, as consulting specialist, in the beneficiation of mineral products. He is a member of the Milling Methods Committee, A.I.M.M.E., and a member of the American Ceramic Society. The foregoing brief summary of his practical experience, given in part for the sake of brevity, points to a series of articles which will have timely value to operating men.—The Editor.

hydroclassification, conditioning with reagents, separation of minerals in the agitated and aerated flotation cells and dewatering of concentrated minerals.

Essential Conditions

All non-metallic minerals are floatable to some degree by either the organic acid or organic ammonia type of flotation reagent. However, if a selective separation of the wanted mineral or minerals from the unwanted gangue minerals is to be attained, it is essential that the mineralogical character of the ore be such that the minerals can be separated physically by pulverizing or grinding. It is fortunate that many of the non-metallic ores now processed contain mineral crystals or particles which are almost wholly liberated between 14 mesh and 35 mesh. There are, however, innumerable ores which require a 100 mesh grind or even a -325 mesh or -44 micron grind before satisfactory mineral liberation is obtained. The tremendous increase in surface area produced by the finer grind does make the selective separation somewhat more difficult but nevertheless the separation is economically feasible. This is borne out by the fact that selective separations of non-metallic minerals are being made commercially on ore which has been ground until the flotation feed contains 30% of -7.5 micron particles. The writer further has made selective separation of the same non-metallic minerals ground to 92% -7.5 microns and having a surface area of 5,300 square centimeters of surface per gram of flotation feed. Separations such as these have long been considered impossible for non-metallics. In view of recent data it is possible to economically separate most non-metallic minerals without regard to the particle size, particle shape, or the specific gravity of the minerals being separated.



Curves showing the rapid rise in value of non-metallic mining products, going back to 1880, compared with the value of metallic mining production. An even more pronounced rise in the production curve would be shown for non-metallics if it had been plotted on a tonnage basis

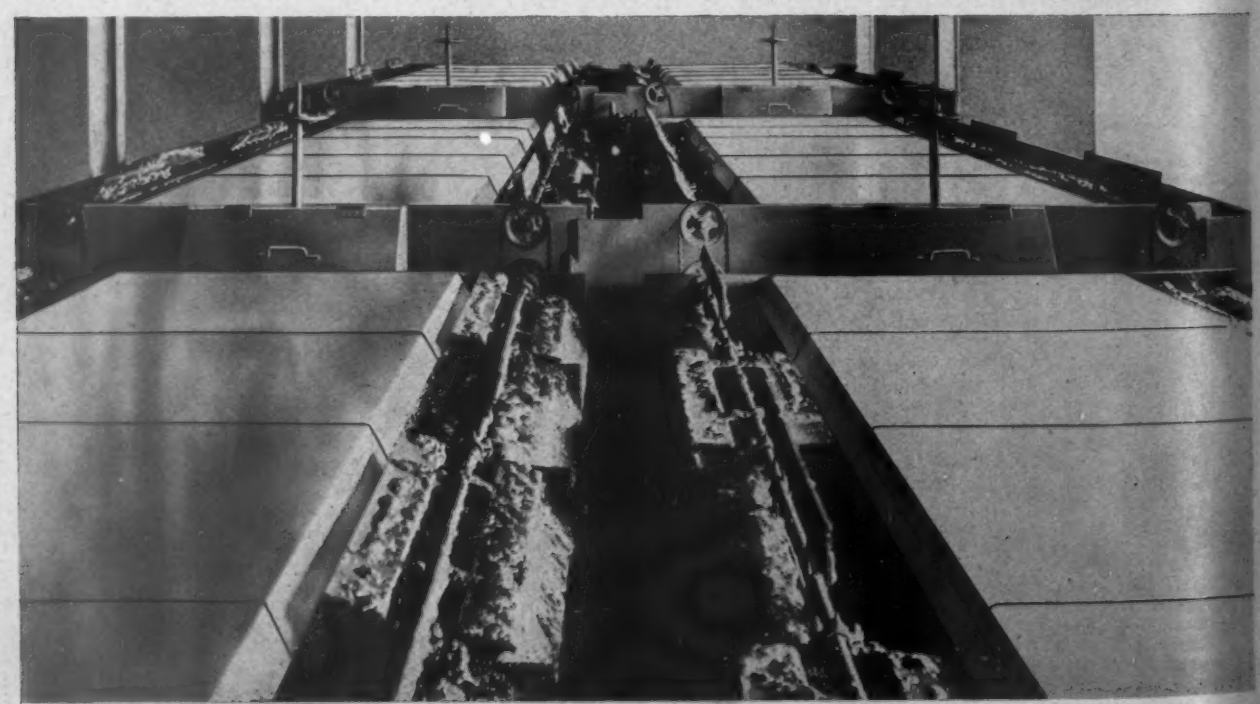
Purpose

Froth flotation is used for varied reasons. It was first employed by those concentrating non-metallic minerals to increase the recovery of salable mineral concentrates by treating mill waste containing that particle size fraction not readily beneficiated by simple methods such as jigging, tabling or screening. In many instances everything finer than 14 mesh or even 4 mesh was rejected for lack of a suitable concentrating method. It is needless to say that the life of many mining properties has been doubled by the utilization of froth flotation. In the face of ever-increasing costs countless mills have not been abandoned as uneconomical.

Tailings or gangue minerals of yesterday are today being concentrated by froth flotation methods to yield one or several salable products. It is difficult to understand why so many valuable minerals have been wasted in mill or quarry tailings. It is often most profitable to ask the question, "What am I throwing to waste?"

Higher grade concentrates are not only desirable but are essential in present day competitive markets. Froth flotation methods are often used for the sole purpose of increasing concentrate grades even beyond that attainable by other more simple methods such as magnetic concentration, jigging, screening, tabling, etc.

Pegmatites are an unlimited source of many non-metallic minerals such as spodumene, feldspar, silica, mica, garnet, rutile, ilmenite, syenite and many other important industrial minerals. One of the most important sources of the rarer non-metallic minerals, the pegmatites will be utilized to an ever-increasing extent now that new methods for separating these fine grained mineral crystals by froth flotation methods are being continually discovered. It is interesting to note that most pegmatites



Action view of American Cyanamid Co. Steffensen flotation cells which employ air dispersion for froth

Flotation unit, to the right, in Florida phosphate plant, with sizers in lower foreground and bowl classifier, to the left

always are the source of more than one salable mineral concentrate. An example is a North Carolina pegmatite which yields concentrates of spodumene, a valuable source of lithium; feldspar, a valuable ceramic flux; mica, a valuable industrial mineral used in the roofing industry; garnet, a valuable abrasive; rutile, a valuable source of titanium and silica, from which a very pure silicon dioxide for the glass industry is obtained. In the future it will be increasingly difficult to ignore such a versatile source of industrial minerals or to throw away mill or quarry fines containing any of the non-metallic industrial minerals. In the past it has been the glitter of metal which turned eyes away from the more permanent luster of the non-metals.

The adjustment of chemical ratios, such as the SiO_2-CaO-Al_2O_3-Fe_2O_3 ratio familiar to the cement industry, has become a very important purpose of froth flotation. Minerals, such as mica or other aluminum silicates, may be froth floated to adjust the cement rock slurry to almost any ratio demanded for a particular type of cement product. In the glass industry, the ratio of Al_2O_3-SiO_2 is adjusted by froth flotation methods and the Fe_2O_3 content can easily be decreased from tenths of a per cent to hundredths of a per cent.

Non-Metallic Flotation Agents

Reagents used in froth flotation of non-metallic minerals have about four major functions.

1. Frothers: Collectors used for non-metallic minerals are also frothers. However, the type of froth produced is not always suitable to a selective separation of the minerals involved. Therefore it is often necessary to use a frothing agent, the function of which is to reduce the surface tension of the suspending liquid thereby regulating the size of the bubble, the depth of the froth zone and, most important of all, the activity within the froth zone. This activity is caused by the bursting of bubbles, a condition sometimes essential to good selectivity since it allows entrained gangue minerals to work down through the froth zone and into the liquid zone where they are rejected as unwanted minerals. Frothers most common to non-metallics are steam distilled pine oil, such as Yarmour F, and the higher alcohols known as DuPont's frother B-23. Amounts used are relatively small; 0.05 to 0.1 lb. per ton of flotation feed is generally sufficient.

2. Modifiers: pH, which denotes the concentration of acidic hydrogen ions or the concentration of basic hydroxyl ions in water, is by far one of the most important considerations if the inherent advantages of each type of reagent are to be used to the fullest extent. Fatty acids, or anionic reagents, with few exceptions are used in flotation pulps having varying degrees of alkalinity. Modifying reagents, generally used to increase the alkalinity of a flotation pulp, are caustic soda and soda ash. Occasionally sodium cyanide, sodium phosphate and lime are also used.

Amines, or cationic reagents, collect minerals equally as well in an acid pulp as in an alkaline pulp depending, of course, on the minerals being floated. Sulfuric acid is used to reduce the pH below the neutral 7. At times, hydrochloric acid or acid salts are used to good advantage.

3. Depressants: The inherent tendency to float can be altered to a certain extent by a group of reagents called depressants. These surface active agents increase the water wettability of certain non-metallic minerals to such an extent that they are no longer floated by froth flotation reagents. This action is somewhat selective and therefore those minerals which have approximately the same floatability may be separated by proper use of depressants. The most generally used depressants are starch, various proteins and the extract of many tree barks, such as quebracho.

4. Collectors: Collectors used commercially fall into two general classes, organic acids and organic ammonias.

The organic acid is usually one of the fatty acids more commonly known as the Neo-Fat series, oleic acid, red oil or tall oil. Often spoken of as anionic flotation reagents, this group is more selective to those non-metallic minerals which have a high concentration of positive surface charges. These surface charges attract the negatively charged fatty group of the fatty acid and the mineral surface is then filmed by the fatty acid. The group of minerals most easily floated with fatty acids are fluorspar, barite, phosphate, calcite and similar minerals. Therefore the function of organic acids is to wet those minerals having a high concentration of positive surface ions. The result of this wettability is a hydrophobic film which is not water wettable but which becomes attached to air bubbles.

The fatty acids generally used contain from 6 to 24 carbon atoms. They are all straight chain aliphatic fatty acids designated by the general formula RC00H. R is 5 to 23 carbon

(Continued on page 99)

GYPSUM MINE MECHANIZATION

First of two articles on modernization of gypsum mines describes latest undercutting, drilling and blasting practices

By E. R. CUSHING

GYPSUM MINING is an old profession in the United States. Twelve of the present thirty gypsum mines have been in operation more than 40 years and the majority of the remaining eighteen have been 20, or more, years in operation. The Grand Rapids Plaster Co., mine in Michigan has been in operation over ninety years at the original location.

However, only in the last five years has any real progress been made in mine mechanization, aside from progressing from hand drilling to machine drilling and from mule haulage to locomotive haulage. In the banner U. S. production year of 1926, which totalled 4,000,532 tons of gypsum mined underground, at least 98% of the rock was loaded the hard way—by hand labor.

Labor Shortage Speeds Mechanization

Even before Pearl Harbor, it became increasingly evident to gypsum mine operators that the general step-up in industrial production was creating a shortage of mine hand laborers. The newer generation in mining districts evinced no desire to work with a shovel when well-paying factory jobs were available. Many gypsum mines went through the war years with members of mine crews averaging over 45 years of age. One gypsum mine in Western New York with a 100-man crew in March 1942, had less than 30 men by 1943—in 1944 barely keeping the surface plant in production by hauling 40,000 tons of rock nine miles from two cement gypsum rock producers for 50% of the plant requirements.

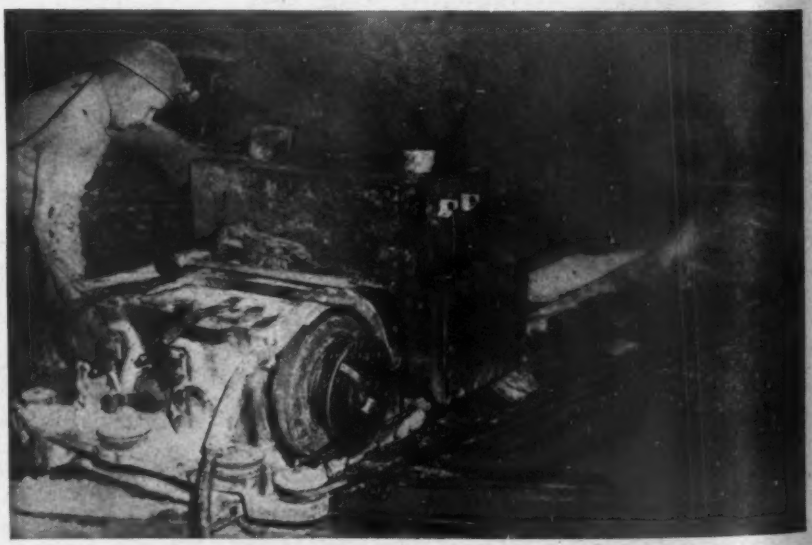
As a result of these various factors, the gypsum mine operators entered into mechanization programs very whole-heartedly and, despite labor and supply difficulties, really laid a

THE AUTHOR

• With a background of many years of mining experience, Edward R. Cushing, the author is well-equipped to present a very authoritative article covering the interesting subject of Mine Mechanization. The article will appear in two parts, the second of which will be published in the August issue of ROCK PRODUCTS.

Since August, 1945, he has engaged in mining consultant work for gypsum and other mining interests.

An electric drill in 14-ft. gypsum seam drilling from auxiliary bottom drill saddle. Two lines of 12-ft. holes drilled from each post position, upper holes drilled from upper saddle positioned by hand winch cable. Drill penetration speed 48 in. per minute



A 50-hp. undercutter partially "sumped in" a 10-ft. height gypsum seam with pull rope doubled to ease strain. After "sumping," the cutting rate for 8½ ft. depth across the face, single-rope, is 6 in. per minute. Top tank contains gypsum dust-cutting solvent oil which is dripped on cutter chain to prevent clogging

basic groundwork for mine mechanization production and cost savings which will pay dividends in the post-war market.

Three principal factors preclude the probability that underground gypsum mines in United States will again equal the 4,000,532 tons produced in 1926; the increased volume of wallboard used replacing plaster, with a resulting decrease of gypsum rock required; the abandoning of mines operating in 1926 for quarry operations; the increased volume of imported Nova Scotia gypsum supplying the gypsum plants installed along the Atlantic Coast since 1926.

However, it is probable that underground gypsum mines in the United States will be required to produce some 3,000,000 tons of gypsum rock annually for the duration of the housing and construction large-volume requirements. Since less than one-third of the gypsum mines of the United States could be considered as operating with complete modern mechanized mining methods, there is a wide open field for improvements. Additional equipment will also be required by present mechanized mines to meet post-war gypsum demands.

Mining problems in limestone, shale, talc, cement rock, clay and other nonmetallic minerals are closely related to gypsum mining and the mine mechanization methods and equipment installations and operations should be of mutual interest. Manufacturers of mine equipment have broadened their field in the past decade with gypsum and nonmetallic receiving individual attention to their specific problems instead of having to wait for developments in the coal and metallic mines.

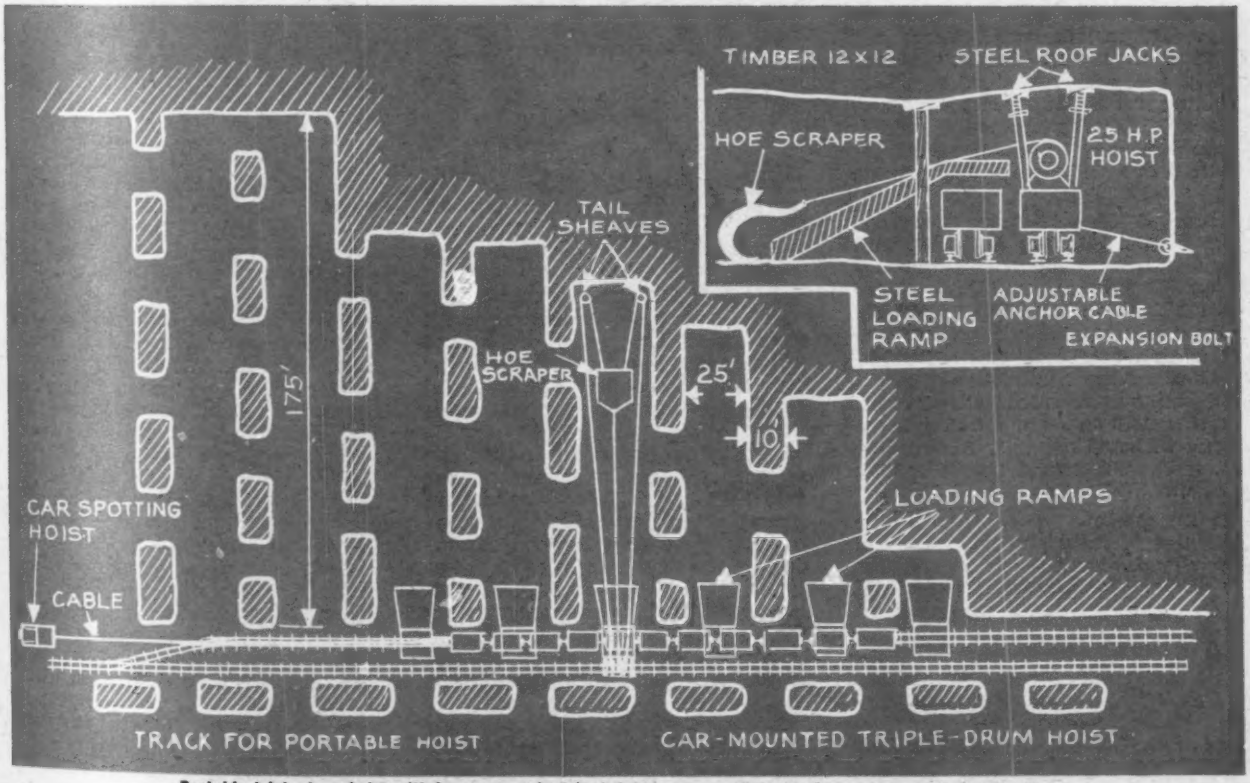
Mine mechanization must be considered as an all-encompassing term, starting with drilling-face preparation and taking in all operations until the crushed rock is delivered for plant use. All of the various operations have to be closely integrated. Production delays in mechanized mining are, comparatively, more severely penalized than with hand loading, since a rock loading machine not operating, is an investment not earning its way. Hand loaders usually produce their daily quota despite minor delays while machine loading lost production is "down the drain."

Drilling and Blasting

Since the first steam hammer drill was tried out in gypsum near Paris, France in about 1855, gypsum drilling has been accomplished by steam, gasoline and air, hammer-type drills; and finally by electric auger type drills. Many gypsum mines were still using primitive hand drilling methods as late as 1910 and even in 1940 the electric auger drills used in 90% of the underground mines were of 1915, or earlier, vintage. This inertia on the part of the gypsum operators and the drill manufacturers toward drill improvements for gypsum mining was engendered principally by the manufacturer's concentration in the past on his largest and best customer—the coal mining industry.

About 1940 several gypsum operators changed from the hollow feed bar type auger drill to the solid feed bar type, high-speed drill with a hand-adjusted ratchet extension drill post. The Jeffrey A-6 type 1½-hp. drills are available in six penetration speeds forward with 250-volt d.-c. motor (18, 23, 28, 35, 46, and 57 in. per minute—417 r.p.m.) and four speeds forward on 220 or 440-volt a.-c. motor (23, 29, 36 and 45 in. per minute—486 r.p.m.)

The drills replaced had only a single speed of 24 in. per minute using a 3 h.p. d.-c. motor and no reverse speed, while the new drills have a pull out reverse speed of four times the forward speed. Friction plate speed adjustment, drill shank socket and on-off power switch took the place of the older type drill's friction band speed adjustment, dou-



Portable triple-drum hoist with hoe scraper in 8-ft. height gypsum. Note loading arrangement, insert, above

ble set screw drill chuck and hand-held power plugs. Although the new drills required 3-ft. drill changes with a 6-ft. feed bar or 4-ft. drill changes with a 7-ft. feed bar, experienced drillers soon made drill changes faster than with the old type chuck adjustment.

Detachable bits were also introduced, both electric furnace hardened 4-lip steel bits and carboloy-faced bits, along with flight-conveyor type augers replacing standard twist augers in some instances. Detachable bits were adopted as a general practice with the steel bits more economical in soft gypsum and the more expensive carboloy bits used only when dolomite, anhydrite or limestone was encountered. Flight-conveyor type augers replaced the standard twist augers when faults or hard seams in the gypsum tended to deflect the auger and when straight bottom holes were necessary to avoid breaking through into water seams below the gypsum. Twist augers stand up better under bending stresses and are more easily retrieved from the drill hole than the flight-conveyor augers manufactured to date.

Typical Examples of Improved Drilling Equipment

The following are some typical examples of improved drilling equipment:

MINE A—In a 48-in. high gypsum seam, the installation of Jeffrey A-6 special aluminum alloy drills enabled the mine operator to replace drilling and blasting 2-man crew producing 140 tons per shift, with 1 man producing 90 tons per shift, resulting in a net saving of 6c per ton piece work labor.

MINE B—In a 42-in. gypsum seam, the standard Jeffrey A-6 drill, with 2-man crew drilling and blasting, produced 160 tons per shift compared to 110 tons with old drill. Piece work rates were not changed however, because of general war-time labor conditions and the introduction of trackless mining required added work moving drill between working faces, along with the necessity for working lower than standard height mining areas.

MINE C—In a 14-ft. seam, installation of 14-ft. height extension drill posts with hand cable winch for raising and lowering Jeffrey A-6 drill with 46-in. per min. penetration speed, were replaced with double 5-ft. post, 24-in. per min. drill. Line, or "slab" round, shooting method with 12-ft. depth holes replaced former V-cut method, and 2-man crew drilled and blasted 185 tons per drill shift compared to former 130 tons. This resulted in a 6c per ton total drilling and blasting labor cost compared to original 11c cost.

MINE D—Two Jeffrey A-6 drills with carboloy bits replaced two hollow feed bar drills using hand sharpened bits on a drill Jumbo setup drilling a 9 ft. height bench of gypsum, 25 ft. wide, with 9 ft. depth horizontal holes. The new equipment raised the tons per shift drilled from 160 tons to 280 tons. With a 3-man crew drilling and blasting, the labor cost was reduced from 14c per ton to 8c per ton. This operation expects to increase the depth of the drill holes to 12 ft. and possibly 15 ft. by using flight conveyor type rigid drills to avoid misdirected holes penetrating bottom water seam.

Selecting Proper Drill

In selecting the proper drill, augers and bits the following factors must be considered:

(1) The relative hardness of the gypsum seam, including impurities, governs the speed of drill penetration selected, with 29 in. per minute possible in hard gypsum streaked with dolomite and 57 in. per minute in soft gypsum. Each feed bar has two speeds, depending on the feed nut used.

(2) The alternate choice of a 6-ft. or a 7-ft. length feed bar depends wholly on the mine clearances—room widths, timbering, angle of holes, etc. The 7-ft. feed bar allows an extra foot between drill changes but the sleeve guard extends an additional foot behind the drill machine.

(3) Voltage and current selection are mostly a matter of power characteristics available, although d.-c. current allows more varied speed selection and small standard a.-c. voltage transformers are comparatively cheap.

(4) Standard steel detachable bits are more economical than carboloy bits in soft gypsum and the same gage bits can be used for all drill lengths.

(5) In hard gypsum formations with anhydrite or dolomite present the comparatively high initial cost of carboloy bits is more than offset by their better durability and sustained drilling speed as compared to standard steel bits.

(6) Standard twist auger steel can be used unshanked with the regular solid feed bar drill socket and performs better than the flight conveyor type in most gypsum formations. The twist auger has less tendency to become clogged with damp drill cuttings and is more flexible.

The drill jumbo used in MINE D above was made up by erecting an A frame on a standard Joy T-1 caterpillar chassis mining machine truck and pivoting a rectangular 3-in. pipe frame work from the back end of the truck with drill cradles attached to the corners of the frame. The drill cradle frame was raised and lowered by a cable arched over the A frame and operated with a hand winch. The weight of the machine truck proved sufficient to operate the drills without anchor spike rods. A used electric caterpillar bulldozer has since been purchased and the dozer blade will be replaced with a drill cradle bar to be positioned with the motor-operated hydraulic lift.

This type of drill jumbo reduces drill set up and moving time losses to a minimum, particularly where the seam would require a drill post higher than 14 ft. Drill jumbos should also prove economical in lower height seams where large daily tonnages would make the investment worthwhile. The development of a heavier electric auger drill, with a 10 or 12-ft. single-run drill, is made possible by using a jumbo since the drill weight would not be objectionable. Such a drill would probably increase drilling tonnage about one-third.

The use of compressed air drills for gypsum mines, except in unusual conditions, is uneconomical since the electric auger type drill drills about three times as fast, requires one-fifth as much horsepower and does not have the objectionable dust or water characteristic of air drills. However, paving breaker type air drills have been found very effective for secondary rock breakage ahead of the loading machine or crusher.

In Western New York with 48-in. height gypsum, an average piecework 2-man drill crew can drill and blast 50 holes per shift or a total footage of 500 ft. with the improved electric auger drill, and in a 14-ft. height Texas gypsum seam a 2-man crew drills and blasts 32 holes per shift for a total footage of 384 ft. (48-in. seam, 3 tons per hole—14-ft. seam, 5 tons per hole). These daily total drill footages could not be approached with air drills.

Blasting procedure is an individual problem for each different type of gypsum seam and mine conditions. Generally speaking, the smaller diameter drill hole using high stick count by weight powder gives the best results. Usual gypsum dynamite is within a range of 6000 to 8000 ft. per sec. velocity and 160 to 205 sticks to a 50 lb. box. Undercut gypsum with light dynamite requirements per hole usually is loaded without tamping or stemming to get better breakage in the front. A proper balance must be arrived at between the drilling and blasting cost and the rock sizing as it affects the mine production rate. In other words, drilling more holes and using more powder may reduce the rock sizing enough to create a favorable balance in increased loading machine and crusher production, particularly if secondary pop-holing or paving

(Continued on page 106)

Determination of VINSOL RESIN In Portland Cement

By LEONARD BEAN* and R. B. PEPPLER*

• Vinsol resin in portland cement is now determined either by extraction with chloroform or from its methoxyl content. Results obtained by a comparison of the two methods frequently differ. In a study of the methods, it was found: (a) that the temperature of drying the extract (57-63 deg. C) called for in the first method is not high enough to remove all chloroform; (b) that contact of the resin with hydrochloric acid and stannous chloride reduces the methoxyl content; (c) that sodium hyroxide solution reacts with the resin. The use of the methoxyl method as a quantitative measure of Vinsol resin in cement is questioned.

DURING recent years the use of air-entraining additions to portland cement has been increasing. The presence of such agents increases workability, reduces mixing water requirements, increases the resistance of the concrete to frost action, and reduces scaling caused by the use of salts for de-icing. Specifications have been promulgated by the A.S.T.M. and other agencies to cover such additions.

Vinsol resin has been used considerably to effect air entrainment. At one time the amount of resin present in cement was required to be held within definite limits. Present specifications do not limit the amount of resin but specify the amount of air which must be entrained by an air-entraining cement when mortar is made from it. Identification of the resin is required.

In connection with some studies which were made at the National Bureau of Standards, quantitative determinations of Vinsol resin in cement were required. This work brought to light some facts which may be of interest to those called upon to determine the Vinsol resin content of treated portland cements.

At present two methods are used for the quantitative determination of Vinsol resin in portland cement. One employs merely an extraction with chloroform and would admittedly be in error if tallow, mineral oil, common rosin, calcium stearate or other chloroform-soluble material were present.[1] The second method[2,3] is based on the methoxyl content of the chloroform extract.

In 1942, the National Bureau of Standards, together with five other laboratories, participated in a coöperative test on the determination of Vinsol resin in cement, by the methoxyl method. A tentative method of analysis, based on the results of these tests and previous work by other laboratories, was published.[3,3] Subsequent investigations[4,5] have shown considerable discrepancy between results obtained by extracting the resin with chloroform and by calculation from the methoxyl content of the extracted resin.

The following factors which might influence the determination of Vinsol resin were investigated: 1. temperature of drying the chloroform extract; 2. the loss of methoxyl during contact with the hydrochloric-acid-stannous-chloride solution; and 3. the effect of sodium hydroxide.

TABLE 1: COMPARISON OF PERCENT OF CHLOROFORM-SOLUBLE EXTRACT WITH PERCENT OF VINSOL RESIN CALCULATED FROM METHOXYL CONTENT, ON SAMPLES OF CEMENT TO WHICH KNOWN AMOUNTS OF RESIN HAD BEEN ADDED

Vinsol Resin Added, Percent	$CHCl_3$—Sol. Extract Dried at 60° C, Percent	Vinsol Resin Calculated,* Percent	CH_3O in Extract Dried at 60° C,† Percent
0.050	0.051	0.054	5.12
.040	.041	.043	5.07
.040	.041	.043	5.07
.040	.039	.043	5.27
.040	.039	.023	2.82
.040	.039	.044	5.45
.040	.039	.043	5.27
.020	.018	.014	3.62
.020	.018	.014	3.66

*Calculated from fromula[2]:

Vinsol resin, percent = (A — B) R

where A = ml. $Na_2S_2O_3$ required to titrate the sample

B = ml. $Na_2S_2O_3$ required to titrate the blank

R = value of 1 ml. of the $Na_2S_2O_3$ solution in terms of percentage of Vinsol resin in a 40 g. sample of cement = $\frac{N \times 0.02716}{.1}$ where

N = normality of $Na_2S_2O_3$. 0.02716 = Vinsol resin value of an exactly 0.1 N $Na_2S_2O_3$ solution.

†Calculated from formula:

$$\frac{\text{Net ml. } Na_2S_2O_3 \times \text{normality of } Na_2S_2O_3 \times 0.005172 \times 100}{\text{Weight of extract dried at 60° C}} = \% \ CH_3O$$

where 0.005172 = gram of CH_3O equivalent to 1 ml. of N $Na_2S_2O_3$

Apparatus, Reagents, and Methods

The apparatus used in methoxyl determinations is that pictured on page 1223 of A.S.T.M. Standards 1944, Part II (C114-44T), with the following exceptions: A ground-glass joint was used at the top of the first absorption tube instead of rubber. The reaction flask had a removable inlet tube connected to the flask by means of a standard taper ground-glass joint. Since the lower end of this tube extends inside the flask to a point near the bottom, no boiling tube is required, because the bubbling of carbon dioxide prevents bumping.

The reagents used are those described in the Tentative Method. Hydriodic acid (57 percent, sp. gr. 1.70) was found quite satisfactory as received. If the bottle stood for several weeks after having been opened, the contents generally became quite dark in color due to formation of free iodine. This also caused rather high blank values. The means of purification described in the tentative method were not used, since the following method suggested by Scott,[6] appeared simpler and safer. When about 100 ml. of dark-colored hydriodic acid had accumulated, it was heated to 100 deg. C. and 5 ml. of 50% hypophosphorous acid was added while stirring. The iodine color usually disappeared immediately. After cool-

*National Bureau of Standards, U. S. Department of Commerce, Washington, D. C.

ing sufficiently, the acid was then poured into a clean, dark, glass-stoppered bottle. The acid became slightly yellow as it cooled, but after standing in the bottle a day or two, was practically water white again. Moreover, after such treatment, the acid does not discolor as easily as when first purchased. Acid, so treated, gave low blank values and was considered satisfactory.

A 5-ml. micro burette, graduated to 0.01 ml., was used to measure the standard $Na_2S_2O_3$ solution. Carbon dioxide was supplied from a Kipp generator. The carbon dioxide was passed through a saturated solution of sodium bicarbonate and then through a solution of silver nitrate, in order to remove HCl and H_2S.

In the determination of Vinsol resin in cement, the sample is dissolved in a hydrochloric-acid solution containing stannous chloride. Chloroform is added, the mixture shaken and allowed to separate, and the lower (chloroform) layer, which contains the resin, is drawn off. The extraction is repeated, the extract filtered, and the chloroform is evaporated. The weight of extract represents the amount of resin if other substances soluble in chloroform are not present. The determination of the methoxyl content of the extract is based on the following reactions[2]:

Hydriodic acid reacts with Vinsol resin forming methyl iodide, which is distilled into a bromine solution. The bromine reacts with the methyl iodide, forming iodine monobromide, which produces iodic acid when water is added. The excess of bromine is destroyed with formic acid. Iodic acid oxidizes potassium iodide to free iodine. The iodine is titrated with standard sodium thiosulfate. The methoxyl content of the sample is computed and the amount of Vinsol resin is calculated from it. The computation is based on two assumptions: first, that Vinsol resin contains an average of 5.7 percent methoxyl, and second, that an average recovery of 83.5 percent of the methoxyl can be expected when using the procedure.

The figure of 83.5 percent recovery was obtained as follows[1]: A sample of cement was carefully prepared by grinding clinker with a knqwn amount of Vinsol resin in a laboratory tube mill. Samples containing 0.040 percent Vinsol resin were sent to six laboratories which took part in the coöperative test. This laboratory was one of those taking part. The six laboratories reported values ranging from 78.8 to 87.8 percent of the resin known to be present. The average value was 83.5 percent and this figure was adopted as the standard recovery obtained with the method. It has been shown by Bean and Litvin[3] that the methoxyl content of Vinsol resin can be changed by heating. The temperature attained in grinding cement depends on the type of equipment used and high temperatures persist during long periods of storage. For this reason the loss of methoxyl would be expected to vary from mill to mill.

The methoxyl content of Vinsol resin is quoted in the literature as varying considerably. The product as now made is said by the manufacturer to have a methoxyl content of 5 to 7 percent with an average of 5.7 percent. Since the methyl ethers in Vinsol resin react with hydriodic acid to give methyl iodide, they must be suspected of reacting with hydrochloric acid during the extraction procedure when the resin is in contact with that acid. In fact, efforts have been made to estimate methoxyl based on reaction with hydrochloric acid.[4]

Experimental

1. Preliminary Work.

In the determination of Vinsol resin in 17 representative commercial air-entraining cements, the chloroform extract[1] varied from 0.007 percent to 0.123 percent. The methoxyl method[2] indicated 0.009 to 0.129 percent Vinsol resin in the same cements. The methoxyl in the extracts ranged from 3.64 to 6.20 percent.

Vinsol resin was determined in a number of experimental cements which were prepared by grinding clinker with gypsum and the resin. In these, the resin had been subjected to heat either before or after incorporation with the cement. The temperatures in some cases were as high as 300 deg. F. In 25 of these cements the chloroform extract varied from 0.036 to 0.051 percent. The methoxyl method indicated 0.024 to 0.054 percent Vinsol resin. The methoxyl in the extracts ranged from 2.88 to 5.57 percent. If the weight of chloroform extract after drying at 57 to 60 deg. C. gives the correct amount of resin in the cement, and if the assumptions in the methoxyl method are valid, then the percent methoxyl in the extract should be 4.76 (namely, .835 x 5.7).

In Table 1 are shown some results obtained when known amounts of Vinsol resin were mixed by grinding with cement. The values for chloroform-soluble extract are in closer agreement with the amounts of resin actually added, than are those for Vinsol resin calculated from the methoxyl determination.

Some samples of concrete were examined because they were thought to contain Vinsol resin. A chloroform-soluble extract was obtained which had the appearance and an odor of Vinsol resin. When proper consideration was given to the proportions of the mix, the material extracted amounted to about 0.050 percent of the cement. However, when a methoxyl determination was made on this residue, only a trace of methoxyl was detectable. This suggested that Vinsol resin may lose some of its methoxyl when in contact with the alkalinity which prevails in concrete at all times.

TABLE 2: DETERMINATION OF METHOXYL CONTENT OF VINSOL RESIN USED IN THIS STUDY

A — Analytical Balance Used		B — Micro Balance Used	
Wt. Sample Gram	CH_3O Percent	Wt. Sample Gram	CH_3O Percent
0.0170	5.50	0.02824	5.63
.0578	5.53	.01608	5.66
.0426	5.54	.02376	5.68
.0396	5.55	.03132	5.69
.0408	5.59	.03400	5.70
.0449	5.64	.02700	5.77
.0156	5.70	.02037	5.78
.0122	5.72		
.0325	5.72	Average	5.70
.0333	5.77	Average deviation from mean	±0.04
.0144	5.90		
.0081	5.93		
.0289	5.94		
Average	5.69		
Average deviation from mean	±0.12		

2. Accuracy of Methoxyl Method.

In order to determine the accuracy of the method, and to test the apparatus, methoxyl determinations were made on anisic acid (NBS Standard Sample 142, 20.39 percent methoxyl). When the determinations were made according to the method outlined in Sections 11 to 13 of C114-44T of the A.S.T.M., an average value of 20.36 percent methoxyl was obtained.

3. Determination of the Methoxyl Content of Vinsol Resin.

Thirteen weighed samples of the resin were placed in methoxyl flasks. The samples ranged from 8 to 58 mg. in weight. The methoxyl values obtained ranged from 5.50 to 5.94 percent, with an average of 5.69 (Table 2A). The average values substantiate the claim of the manufacturer for a 5.7 percent average methoxyl value for his product. Seven more samples were weighed on a micro balance, and the methoxyl values of these (Table 2B) ranged from 5.63 to 5.78 with an average of 5.70.

4. Effect of Drying Temperature.

Six samples of the resin, weighing 10 to 20 mg. each, were placed into 100-ml. beakers and dissolved in 10 ml. of chloroform. These solutions were evaporated to a small volume, then dried with a stream of air which had been passed through calcium chloride and magnesium perchlorate. They were then heated for 3-minute periods at 60 deg. C. until their weights were constant within one milligram. At this point, the residues weighed about 2.5 mg. more than the original samples, indicating that the chloroform had not been completely driven off at 60 deg. C. This increase is equivalent to 0.006 percent resin based on a 40-g. sample of ce-

ment. The residues were then heated for three 15-minute periods at 100 deg. C. At the latter temperature the weights approached to within 0.5 mg. of the weights of the original samples during the first heating period, and remained constant during the second and third. This indicates that one 15-min. period of heating at 100 deg. C. should be sufficient. The methoxyl values were then determined, and were found to range from 5.62 to 5.98 percent (Table 3A) with an average of 5.77 percent. This value is sufficiently close to the value of 5.69 percent previously obtained (Table 2) to warrant the conclusion that heating for 45 min. at 100 deg. C. did not affect the methoxyl content.

5. Effect of Evaporating with Chloroform.

In the A.S.T.M. extraction procedure about 150 ml. of chloroform is required. In order to determine what effect the evaporation of resin with 150 ml. of chloroform might have on the methoxyl content, a series of six 10- to 60-mg. samples were weighed into beakers and dissolved in 150 ml. of chloroform. These were evaporated to a small volume on the steam bath, filtered through retentive paper, transferred to methoxyl flasks, and again evaporated to incipient dryness. After being dried with air, they were heated at 100 deg. C. for 15 min., and the methoxyl content determined. The values were found to range from 5.40 to 5.57 percent with an average of 5.52 percent (Table 3B). This is 0.17 percent lower than the value obtained for untreated resin (5.69 percent). Evaporating the resin with chloroform appears to lower the methoxyl content of Vinsol resin slightly.

6. Effect of Extraction Procedure.

A series of samples were extracted with chloroform and methoxyl values determined. In this series the times and temperatures of solutions and the conditions of cooling, which in the A.S.T.M. method are not exactly defined, were standardized in the following manner: Three cements were chosen at random and 40-g. samples of each were dissolved in the specified amounts of water and $SnCl_2$-HCl solution, the time and temperature of solution being noted. They were then cooled to 20 deg. C. in a water bath, and the time of cooling noted. The averages of these conditions were as follows: 5 min. to dissolve, temperature of 58 deg. C. attained, and 20 min. required to cool to 20 deg. C. These conditions were taken as standard unless otherwise noted.

The extraction itself differed from the A.S.T.M. specified extractions only in the use of a 25-ml. chloroform solution of a known weight of Vinsol resin instead of a sample of air-entraining cement. The methoxyl contents were determined and percentages of methoxyl were calculated based on the original weights. The values ranged from 5.18 to 5.25, with an average of 5.22 percent (Table 4).

TABLE 3-A: EFFECT OF CHLOROFORM ON VINSOL RESIN
Evaporation from Solution in 10 ml. of Chloroform Followed by Drying at 60° C and Then at 100° C

Wt. Sample, Gram	Wt. After Drying at 60° C, Gram	Wt. After Drying 15 Min. at 100° C, Gram	Wt. After Drying 30 Min. at 100° C, Gram	Wt. After Drying 45 Min. at 100° C, Gram	CH_2O Based on Wt. After Drying at 60° C, Percent	CH_2O Based on Weight After Drying at 100° C for 45 Min., Percent
0.0186	0.0217	0.0192	0.0190	0.0190	4.91	5.71
.0116	.0137	.0119	.0119	.0118	5.04	5.97
.0157	.0187	.0165	.0164	.0163	4.68	5.56
.0175	.0209	.0186	.0185	.0183	4.79	5.98
.0211	.0227	.0217	.0216	.0216	5.23	5.62
				Averages	4.93	5.77

TABLE 3-B: EFFECT OF EVAPORATION FROM SOLUTION IN 150 ml. OF CHLOROFORM

Wt. Sample Gram	CH_2O* Percent
0.0577	5.56
.0505	5.57
.0164	5.50
.0260	5.50
.0184	5.40
.0342	5.57
Average	5.52

*Based on original wt. of sample.

In checking the extraction for factors which might contribute to the loss of methoxyl, the time of contact between the Vinsol resin and the HCl-$SnCl_2$ solution, was first considered. If some methoxyl were lost as methyl chloride, during extraction, for example, this loss should increase with the time of contact. Six 11- to 38-mg. samples were weighed into 100-ml. beakers, dissolved in 25 ml. of chloroform, and taken through the regular extraction, except that the resin was kept in contact with the HCl-$SnCl_2$ solution for one hour at 58 deg. C. After this the methoxyl contents, based on the original weights, were determined in the usual manner. The values ranged from 4.45 to 5.64 percent, with an average of 4.92 percent. These values are considerably below those obtained when the period of contact was 5 min., and indicate that the time of contact, not now specified in Sec. 27 (C114-44), affects the methoxyl content.

7. Effect of Stannous Chloride and Sulfur.

Ten samples of Vinsol resin were extracted with chloroform and methoxyl determined in the absence of stannous chloride. The percentages of methoxyl based on the original weights ranged from 5.32 to 5.50 percent with an average of 5.43 percent. These values are consistently higher than those resulting from the regular extractions (Table 4) and indicate that omission of stannous chloride in the extraction might give a more accurate value.

Stannous chloride is added to cement to prevent any sulfides present from becoming oxidized to sulfur, which is somewhat soluble in chloroform.[5] A series of samples of resin were mixed with known amounts of sulfur, and the methoxyl content of each of the mixtures was determined. The percentages, based on the weight

(Continued on page 108)

TABLE 4—METHOXYL CONTENT OF VINSOL RESIN OBTAINED BY THE A.S.T.M. METHOXYL METHOD*

Wt. of Vinsol Resin Taken, Gram	Wt. V.R.* Calculated, Gram	Wt. of Extract After Drying at 60° C, Gram	Wt. of Extract After Drying at 100° C, Gram	CH_2O Based on Original Wt., Percent
0.0238	0.0259	0.0263	0.0238	5.18
.0208	.0229	.0234	.0213	5.24
.0287	.0314	.0321	.0288	5.22
.0277	.0306	.0311	.0277	5.21
.0309	.0337	.0331	.0303	5.20
.0263	.0290	.0291	.0269	5.25
			Average	5.22

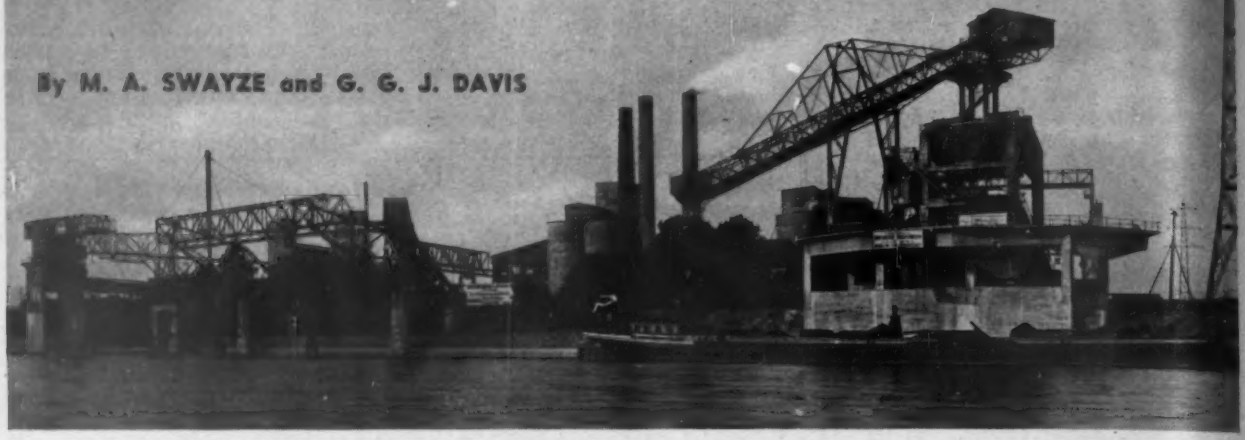
*Using formula:

$$\text{Grams Vinsol resin} = \text{net ml. } Na_2S_2O_3 \times \text{normality} \times 0.005172 \times \frac{100}{5.7} \times \frac{100}{83.5}$$

where 0.005172 = g. CH_2O equivalent to 1 ml. of N $Na_2S_2O_3$
5.7 = recommended value for percent CH_2O in Vinsol resin
83.5 = recommended value for percent recovery of CH_2O by the tentative method.[3]

Processing

By M. A. SWAYZE and G. G. J. DAVIS



View of one of the German cement plants along the Rhine river as it looked before the War. Note unusual barge loading and unloading facilities for limestone, clay, and cement. Photograph taken from the files of ROCK PRODUCTS

What Has Happened to CEMENT INDUSTRY IN GERMANY?

First of two reports based upon field investigation discloses developments of interest to cement manufacturers and manufacturers of machinery and refractories

THE PURPOSE of the investigation here reported was to determine what advances had been made by the German cement industry preceding and during the war, knowledge of which would be of value to the American and British industries. The scope of the investigation covered by a critical appraisal of cement quality and manufacturing methods in a group of plants located in the British and U. S. areas of occupation which were considered to be representative of the German cement industry as a whole. Due to need for special arrangements, neither the Russian or French occupied area of Germany nor countries liberated from German control were visited. In addition to cement plant visits, attention was given by the U. S. member of the cement group to concrete quality in both mass construction, small projects, highways and precast concrete products, insofar as it might be influenced by the character of the cement used.

Dates of the investigation and personnel engaged in it, together with their special interests, were as follows:

Dr. Fred M. Lea, Building Research Station, England. July 31-August 24.
Dr. T. W. Parker, Building Research Station, England. August 11-31.
Mr. L. C. Hill (foamed slag-cement industry). August 11-31.
Mr. M. Gallai-Hatchard (foamed slag-cement industry). August 11-31.
Mr. Goeffrey G. J. Davis, British Cement Industry (Portland Cement). August 11-31.
Mr. Myron A. Swayze, U. S. Cement Industry (Cement). July 14-August 31.

In the field work the group divided into two teams, one consisting of Dr. Parker,. Mr. Hill and Mr. Gallai-Hatchard reviewing the manufacture of granulated slag and its use in production of eisenportland and hochofen cements, while Messrs. Davis and Swayze investigated methods of cement plant operation and control. This report deals with the latter investigation only. A separate report is in preparation by the team on slag.

Conclusions and Summary

In the German cement industry the dry process of raw mix preparation predominates strongly over the wet method. In drying the raw materials prior to grinding, use was frequently made of waste heat from rotary kilns. In other plants combination drying and grinding mills of types not used in either England or the United States had been installed. Raw mix finenesses were relatively coarse, emphasis being placed on output and low power consumption rather than a better fineness more compatible with high cement quality. Raw mix storages were almost invariably too small to give good control of mix composition.

For burning the raw mix, many plants still operate vertical kilns, types which were discarded in both England and the U. S. A. years ago. Clinker quality from these kilns is poor according to our standards. In rotary kiln practice the dry raw mix is almost universally nodulized, using 8-10 percent water for this purpose. This practice may have some advantage. Two special methods for lining rotary kiln burning zones merit attention.

Clinker cooling is generally done in rotary coolers located under the rotary kilns. A few coolers of special pressure type were seen, but their performance was usually reported to need improvement.

Proportioning of clinker and gypsum was likewise crude, no installations operating by weight proportions being seen in the 26 plants visited. In proportioning of blast furnace slag with clinker for production of eisenportland and hochofen cement, the same roughness of control was found.

Practically all finish grinding was done in open circuit, only one plant making use of air-separation and circulation of coarse material back to the grinding mill. Fineness data were not comparable to English or U. S. standards due to differences in sieves used, but it was evident that the ordinary cements were somewhat coarser than is considered normal in these countries.

Packing of cement for shipment was almost exclusively in paper sacks, regardless of the shortage of paper pulp in the country. Normal cement was packed in 2-ply bags; high-strength cement in 4-ply. No stock of cloth sacks was seen. Producers

occasionally reported a few bulk shipments during the last years of the war, but stated the practice was unpopular with users.

Cement quality as measured by reports of strength in flexure and compression cannot be directly compared in terms of either English or American standards due to difference in test methods and mixtures, which were revised in 1942. Samples of a special fine sand used in the new plastic testing mortar have been taken to England and will be used in the German standard mix to determine the relative strengths shown by the same cement as tested by English and German methods. Similar tests will be made in the United States. Results will be the subject of a separate report at a later date.

German cement strength specifications cover three qualities of product:

1. Normal cement (Class 225) met by portland, eisenportland, and hochofen cements.
2. "Hochwertig" cement (Class 325) met by portland and eisenportland only.
3. "Hochstwertig" cement (Class 425) met by 5 portland products only.

At least some of these last cements contain calcium chloride. Their manufacture is similar to that of Type III cements as produced in the U. S. A.—high fineness both in raw mix and final product, and hard burning of a higher limed mix. This type of cement was used only for the most urgent work, where speed and high strength were both required. Production was a minor item in total volume. No samples of these products were available for test.

No new cements have come to the production stage, although a "sursulphate" cement, consisting of granulated slag, 15 percent deadburned gypsum and 1 to 5 percent portland clinker was reported to have properties equal to Class 425 when ground to a very high fineness in a laboratory mill.

All plants, even those normally producing only straight portland cement, added blast furnace slag to their clinker to increase output and reduce coal consumption, if they were within any reasonable distance (up to 150 kilometers) of a blast furnace.

Conclusions from the survey of plants in the German cement industry are that quantity had been increased during the war at the distinct disadvantage of quality.

Chemical control methods, and equipment for obtaining it, are inferior to those in use in the States and Britain, in the great majority of the German plants seen. Likewise, the quality of clinker produced is poorer, due to efforts to save fuel.

Machinery for dry raw drying and grinding, developed in the past 10 years, may merit further investigation by our own cement industries, especially the Humboldt type of mill described in the main section of this report. The mill has a novel type of air separator in connection with it, with no moving parts.

• This is the first of two articles on the German cement industry to be published in ROCK PRODUCTS. The report was completed by experts for the Office of Military Government for Germany, Office of the Director of Intelligence. Authors are, respectively, M. A. Swayze, director of research, Lone Star Cement Corporation, representing the American cement industry, and G. G. J. Davis, the British cement industry.

Special bricks for lining of hot zones of rotary kilns have merit, and should be brought to the attention of cement manufacturers and firebrick producers.

Regardless of cement quality, the quality of German concrete is high. Surfaces of a few of the earlier Reichsautobahnen have scaled and are now covered by bituminous materials. However, the great majority of these roads have sound surfaces in excellent condition, despite heavy military traffic. No signs of water separation from the fresh concrete laid in these roads is discernable, due both to the very dry mix used, and to prolonged finishing. In a few cases where precast units were being made, finishing was also being continued longer after the units were cast than is customary in the U. S. A.

In reinforced concrete structures, the steel was always plain round bars, so far as could be seen. The only case of deformed bars found was in one large underground job, and there only in a few precast columns.

In concrete structures, such as bridges and buildings, demolished by bombing or by the Germans themselves, the plain reinforcing bars had no apparent bond with the concrete, frequently being stripped out clean from concrete except for hooked ends. In view of this, use of deformed bars by the concrete industry would be desirable.

In precast concrete units with prestressed reinforcing, the use of high strength steel wire of small diameter gave unusual elasticity to the concrete members, and evidence of very good bond.

Field Investigations

In the course of the investigation of the German cement industry, the plants listed below were visited during the period July 15 to August 31, 1945.

Raw Materials

In nearly all plants visited except two in the Hamburg area, the raw materials consisted of a fairly hard high calcium limestone interspersed with a softer marl of lower lime content, similar to the English Lias formation. In the Beckum area the natural mixture of these materials produced either the desired mix for

Plant	Location	Misc. Data†
1. E. Schwenk Co., Ulm	Mergelstettin-Heidenheim	D-28-V
2. Heidelberger Leimen Port. Cem. Werke	Heidelberg	D-25-R (WH)
3. Wünstorfer Port. Cement Werke, A.G.	Wünstorf	D-40-L & V
4. Breitenburger Port. Zem. Fabrik	Lägersdorf	W-O-R
5. Alsen'sche Portland Cement Fabrik	Itzehoe	W-O-R
6. Norddeutsche Port. Zement Fabrik	Misburg	D-O-V
7. Germania Port. Zement Fab., A.G.	Misburg	D-O-R
8. Portland Zement Fabrik Alemannia, A.G.	Höver, near Misburg	D-30-L & R
9. Dyckerhoff Port. Cem. Werke, Lengerich I.	Lengerich	W-O-R
10. Dyckerhoff Port. Cem. Werke, Lengerich II.	Lengerich	D-O-V
11. Glockner Cement Werke	Georgsmarienhütte (near Osnabruck)	D-O-R
12. Portland Zem. Werke, Nord (Ruhr & Co.)	Beckum	D-O-R
13. Portland Zement Werke, E. Renfert	Beckum	D-O-R & V
14. Beckumer Port. Zem. Werke, Bomke & Bleckmann	Beckum	D-O-R & V
15. C. Mersmann Port. Cem. & Kalk Werke	Beckum	D-O-R & V
16. Phoenix Port. Cem. & Wasserkalk W. (Stein & Co.)	Beckum	D-O-R
17. Portland Cem. & Kalk Werke, "Elsa" A.G.	Ennigerloh	D-O-R & L
18. Portland Cem. & Kalk Werke, "Elsa" A.G.	Ennigerloh	W-O-R
19. Dyckerhoff Portland Cem. Werke, Mark I.	Neubeckum	D-O-R
20. Dyckerhoff Port. Cement Werke, Mark II.	Frederickshorst	D-O-R
21. Anneliese Port. Zement Werke, A.G.	Preussen	D-O-V & R
22. Germania Port. Zem. Werke, A.G.	Ennigerloh	D-O-R, L, V
23. Port. Zem. Werke, Wittekind, Hugo Meisbach Sohne	Erwitte	D-O-V
24. Portland Zement Fabrik, Herman Milke	Geseke	D-50-V
25. Evers & Co. Portland Cement Werke	Büren	D-O-V
26. Narjes & Bender Port. Zem. Werke	Kupferdreh, near Essen	D-O-R
27. Dyckerhoff Portland Cem. Werke (white)	Wiesbaden	W-O-R
28. Dyckerhoff Portland Cem. Werke (gray)	Wiesbaden	W-25-R

†First Column: D—dry process; W—wet process. Second Column: % of kiln capacity in use. Third Column: R—rotary kilns; L—Lepol kilns; V—Vertical kilns; (WH)—waste heat boilers back of kilns.

burning, or required importation of a small amount of high calcium limestone from Warstein, 70 km. south of the area. In the group of plants east of Beckum this formation averaged higher in lime, and had less difference in calcium content between layers. The stone had the characteristics of a waterlime, in which siliceous and argillaceous materials are well dispersed. (This feature may have an important bearing on the low raw finenesses reported). Near Hamburg the plants operated on chalk and clay.

Some plants in the Ruhr are producing portland clinker from blast furnace slag and a high calcium limestone (95-98 percent $CaCO_3$). In the Wiesbaden area, a relatively soft limestone and marly clay is used, again in about the natural proportions for a normal raw mix. Materials for white cement were both imported from other areas in Germany.

A feature in a number of quarrying operations was disposal of earth stripping, wherever this occurred in appreciable volume. Instead of dumping this stripping in large waste piles, it was being placed smoothly on the quarry floor, and in a number of cases good crops were being grown in this soil.

Proportioning Raw Materials

The invariable method of raw material proportioning in all but the slag-limestone plants was to blend stone from various locations in the quarry known to run low or high in lime. Corrections to prepared mixes of incorrect lime content were made by changing the proportions of stone coming from the quarry. No storages of quarry stone at the plants of more than 24 hr. capacity were found.

Crushing and Drying (Dry Process Plants)

Crushing of quarry stone at the plants was usually done in hammer mills of the double shaft type. Occasionally a single shaft mill was seen. One gyratory crusher of small size was in use. Two ingenious feeders for hammer mills operating on sticky materials were found. These consisted of alternate stationary and movable steel bars running between the dump pit and mouth of the crusher. The movable bars operated with an elliptical motion, moving forward above the level of the stationary grid and back below it. Provisions were made for disposal of fine dry stone which dropped between the bars. Feed to the mill was uniform.

In some cases, the output of the hammer mills went almost direct to conventional rotary dryers, with only a few hours' storage between. In other cases where the dryers were heated by waste gases from the kilns, a storage of 12-24 hours' supply was provided. In one case, hot gas from waste heat boilers was used for drying.

Drying was accomplished in either conventional rotary dryers, heated by direct coal fire or waste gas from rotary kilns, or in combination drying and grinding units. The latter method will be discussed under "Raw Grinding." Quantities of fuel for drying varied with moisture in the raw materials, but were of the same order as in U. S. practice.

Wet Grinding of Raw Materials

Crushing methods at wet process plants were the same as those at the dry mills, except at Hamburg plants, where wash mills were used. Grinding of the crushed mix was accomplished in either combination mills or separate ball and tube mills, of the conventional type used in both Britain and America. The operators of these wet mills claimed only a small saving in power consumption for the wet method, but it was noteworthy that they were grinding their slurry to higher finenesses than their dry process competitors, which would insure better lime combination in their clinker at some additional cost in power.

Grinding of raw mix was about equally divided between conventional ball and tube mills or combination mills, and two new types in which the mills were swept by hot gases which dried the material and conveyed the finer particles to an air separator or dust collector. A third type operated on dried feed in closed circuit with an air separator.

Dry Grinding of Raw Materials

The first drying-grinding mill was the equipment produced by Humboldt-Deutz at Koln. This consisted of a ball mill with diameter about 50-60 percent of the length, air-swept by hot gas from a separately fired coal furnace. A large induced draft fan circulated the gas through the mill to a novel type air separator, cyclone dust collector and back to the mill. A second smaller fan drew fresh hot gas into the system by exhausting waste gas from the cyclone to the atmosphere either through a large bag filter or an electrical precipitator. In one case a rain tower was used for cleaning the exit gas. Fresh gas from the furnaces entered the mill at 500-600 deg. C. Exit gases from the system were reported to run 80-100 deg. C. Information on proportions of fresh to circulating gas was meager, but ranged from 1:3 to 1:4. No reliable information was available on gas velocities through the system.

The air separator used with this mill was novel in that it had no moving parts. It consisted of a typical conical shell, short cylindrical section above, with flat top and an exit pipe at top center. The interior of the separator had a smaller, stubbier cone open at the top, but closed at the bottom by four small trap doors. Movable blades set radially for maximum output and lowest fineness occupied the space between the top of the inner cone and the upper section of the shell. The dust laden gases from the mill entered the separator through a vertical pipe at the bottom, and dropped their coarser particles, due to the greater area in the conical section, onto the inner surface of the outer cone, from which they ran by gravity back to the mill. The finer dust passed up through the stationary blades, down into the inner cone and thence up the center pipe to the cyclone collector. The blades could be shifted by a lever mechanism to any angle from radial to almost tangential, thereby decreasing gas flow and increasing fineness of the product. A more complete detail of this type of installation will be found in Report II, where drawings of one installation are reproduced.

The main objection to this equipment is the cost of the structure required to house it, since it needs a stable building of considerable height. The main fans took motors ranging from 110-185 kw, and these were mounted on the upper floors.

The second drying-grinding unit was the Lösche mill, produced by Carl von Gruber at Berlin. This is a vertical edge-runner unit with rotating base table, identical with a unit coal pulverizer produced by International Combustion, Ltd., in England. It is also air swept by hot gas, either from separately coal fired furnaces or the waste gas from rotary kilns, and accomplishes both drying and grinding. However, where relatively high raw mix finenesses are required, as in the United States industry, wear of the rotating table and rolls is reported to be rapid. The same objection applies to its use in pulverizing coal, where it is also employed. The most satisfied user interviewed claimed little upkeep on dry mix, but at this plant the raw fineness was down to 20 to 22 percent residue on the 4900 metric sieve (178 meshes per inch). When the mill can be run on a load of materials sufficient to act as a cushion between rolls and table, wear should be decreased, but fineness of product will not be as good. The mill is not recommended for trial in the United States, due to the higher raw finenesses which are required there in dry process methods of manufacture. It has no application in Britain at present, due to universal use of the wet process.

A third type of mill seen was the Polysius "Pfeiffer" mill consisting of a short ball mill having a ring of parallel longitudinal slots through the lining and shell near the center

line of the mill. Dimensions of the mill shell varied with the capacity desired, but averaged 2.0 m. diameter by 6.0 m. in length. Dry rock was fed at one end, with discharge of ground product through the slots into a short housing over a screw conveyor. The product was elevated to a conventional air separator, from which the coarse rejects were returned to the other end of the mill.

The location of the slots seemed to be still in the experimental stage, since they ranged from mill center in some cases to about 6 percent of length away from the raw feed entrance in others. In one case the shell was perforated by several rings of slots from one end to the other, but this was reported as less satisfactory. The principal objection to this type of mill seemed to be that the presence of the slots weakened the stability of the lining and the strength of the shell, which however could be overcome by proper design. Inspection of mill interiors disclosed some peening of lining metal at slot edges, which would tend to gradually close them.

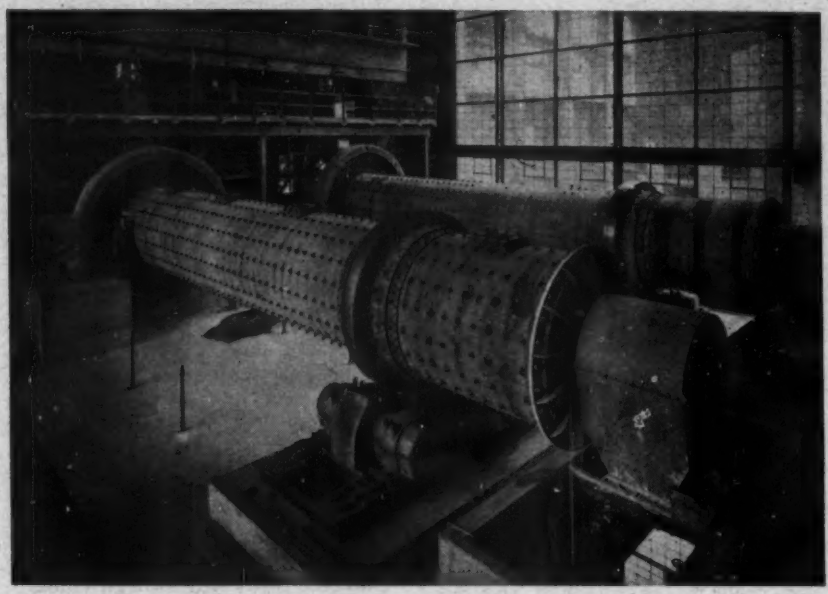
Power consumptions per ton of output claimed for all three types of mill were low, ranging from 8 to 15 kw. per ton. The comparative figures cannot be properly assessed, however, until made on an equal fineness basis. See Report II for checks on fineness.

Preparation of Mix

In the wet process mills an adequate storage for slurry was provided to give a uniform composition for the kilns. Mixing of the slurry was accomplished by air agitation — no mechanical agitation was seen at the three wet plants inspected.

In dry process plants the Polysius system of stirring dry mixes by air injected at the bottoms of mix silos, which has been employed in some American plants, was not used for the reason that operators considered the power consumption for compressing air was too high for the benefit obtained. In very few cases were the dry mix storage silos of adequate number and size to give a kiln feed of uniform composition. In the few plants which were in operation, variations in calcium carbonate content ran as high as 1.0 percent from the desired average.

With a single exception, all of the dry process rotary kilns were fed with a dampened nodulized feed, containing from 8 to 15 percent of water. At first sight this practice seemed absurd, but with its almost complete acceptance, there must be some economy behind it. It is a notable fact that in most dry kiln operations the raw mix flows rapidly through the kiln into the burning zone as soon as it reaches a point where temperature is high enough to drive off carbon dioxide. When this point is reached, the evolution of gas causes the dry powder to become extremely fluffy and fluid, so that the pitch of the kiln and its rotation is enough to start a cascade into the burning area. This may leave a considerable area of the kiln just back of the burning zone relatively empty, thus in effect reducing the effective length while radiation losses are increased.



German cement plant installation of tube mills which are 2.2 meters in diameter and 14 meters in length. Photograph taken from the files of ROCK PRODUCTS

Nodulation of the dry mix requires heat to evaporate the water used for nodulizing, but there is generally more heat in exit gases from dry kilns than can be used to advantage otherwise. Where there is any clay-like material in the mix, the nodules do not reduce to powder again on drying, but more or less hold their original form. This type of grain does not cascade when CO_2 begins to be evolved, and a saving in fuel consumption therefore may result. There should also be materially less dust loss. The practice is recommended for trial by American dry process manufacturers.

Nodulization for feeding the Lepol kilns is a necessity due to the calcination being at least partially accomplished on a moving grate. While many American producers are familiar with this equipment, and British producers are universally using the wet process and therefore cannot utilize it, a short description seems merited.

The dry raw mix is fed into a hollow, smooth steel drum 6 to 10 ft. in diameter and from 9 to 15 ft. in length. Speed of rotation is variable, estimated to average 8-12 r.p.m. A retaining ring at each end with curved junction with the drum serves to hold about 500-800 lbs. of material. The dry mix is fed at a uniform rate at one end, and water is sprayed on this for several feet, until all of the dry powder is dampened and takes the form of balls ranging in size from 1 inch down. Excessive water at any one point in the process produces larger nodules, which are undesirable.

The nodules flow through two ports in the discharge end of the drum and are distributed to a 7 to 8 in. depth on a slowly traveling grate, which moves first through a drying chamber where a small part of the kiln gases are drawn down through the bed by a single exhaust fan. After passing under a partition, the dried bed of nodules is then subjected to further heating by the main body of the kiln gas, which is estimated to be at a temperature of 1000-1100 deg. C. Dust loss is reported to be low for the process. A dust reclaiming hopper and conveyor are located under the grate, the fine particles sifting through being returned to the nodulizer. The feed from the grate drops into a short rotary kiln.

Pug mixers are also employed for dampening the dry mix but are not as efficient, due to slow movement of the material and inevitable overwetting of some portions, resulting in high moisture contents and large particles. Their use is largely confined to mixing of raw material and coal or coke with water, in preparation of the mixture for use in the vertical shaft kilns. [Lepol kilns are in operation in the U. S. at the Spokane Portland Cement Co. plant, Irvin, Wash., and the Santa Cruz Portland Cement Co. mill, Davenport, Calif. An article describing the operation and performance of Lepol kilns at the latter plant was pub-

lished in the December, 1945, issue of ROCK PRODUCTS—The Editor].

In shaft kiln operation a few plants weigh the charge of dry mix and anthracite screenings or coke breeze, prior to mixing with water. The majority seen, however, proportion the two materials by volume. A few shaft kilns use nodulizing drums, but generally the blend of raw mix and fuel is dampened in jug mixers.

Kiln Types and Operation

Both British and American investigators were surprised to find vertical shaft kilns still popular in the German industry, since they have been abandoned in favor of rotary kilns in our countries years ago. Twelve out of the 28 plants visited had vertical kilns in operable condition, while six plants had no other burning equipment. At all of these plants the managements claimed equal cement quality from the shaft kiln product, regardless of the obvious high variability in clinker quality, which ranged from partially burned raw mix through good clinker to fused material. In areas where the ash from the larger fuel particles had combined with the mix, the clinker was badly slagged. In many plants the slow cooling which resulted after fuel was consumed caused the clinker to dust badly, due to inversion of the dicalcium silicate from the keta to gamma form.

The air for combustion is blown into these kilns at two locations. One set of tuyeres is located at the kiln base and serves to cool the burned product and preheat the air for combustion. Another set of tuyeres is located around the shell of the kiln higher up, giving roughly uniform combustion conditions over the kiln section. The dampened mix in nodule or lumped form is distributed automatically at the top of the kiln, but requires an attendant at almost every kiln to keep distribution of fine and overwet coarse material uniform. Combustion begins very close to the top surface of the load, and apparently causes a high temperature to be reached very rapidly. Some difficulty is reported in sticking of the kiln load to sides of the kiln when an excess of fuel is used. Dust losses are variable, but usually moderate.

The principal advantage of this type of kiln is in its low fuel consumption of a low grade fuel, which was reported to range from 17 to 20 percent by weight of clinker produced. Anthracite screenings or coke breeze—both low cost products—were used. Bituminous coal was not satisfactory due to heat losses which would result from distillation of the volatile matter.

While producers claimed equal quality in comparison with rotary kiln products, it was significant that practically all of their cement was marketed as meeting only the lowest strength requirements in German specifications.

Coal consumption in the standard dry process rotary kilns was reported in the range of 22 to 25 percent. Quality of clinker could not be accurately judged, since at most plants the kilns were shut down due to lack of fuel. To judge from existing stocks of old clinker, the manufacturers in general were satisfied with a lighter degree of burning than is found in the American or British industry. Determination of free lime content of clinkers or cement was rarely if ever made, most plant chemists professing ignorance of the test. No equipment or chemicals for the determination were found in plant laboratories.

In design of kiln shells, a variety of shapes was found, with enlarged drying zones for wet mix, and enlarged burning zones. However, most producers favored a uniform kiln diameter, with only enough enlargement of the burning area to compensate for the increased amount of coating formed in this zone.

Of the plants using the wet process, one used a Miag Calcinator and two the Dyckerhoff slurry spray system for driving out part of the water from the slurry and thus utilizing excess temperature in kiln gases. Both methods give rise to large dust losses from the system unless used in conjunction with an electric precipitator or other means of arresting the dust lost. At another plant a Miag Calcinator installation had been in use but discarded due to dust losses. Coal consumption in the wet plants visited averaged 3 to 4 percent higher than at dry process works.

Lepol kilns were installed at four plants seen. These consist of a slowly moving sintering grate, previously described. Operation of grates are reported to be good so long as full calcination of the mix is not attempted. When this is tried, the grates become overheated and warp badly, requiring frequent repairs and renewal. Fuel consumptions for these installations were all reported in the range 15 percent to 18 percent, using coal of 7000 calorie heat value. Again, these claims should be modified in terms of the harder burned English and American clinkers, where lower free lime standards would probably require more fuel consumption.

A new type of kiln patterned after the Dwight-Lloyd sintering grate for metallic ores was reported as in use at two plants. One of these was in the Russian area of occupation, and the other in the French area at Drottinghausen. The latter was not in operation, and was therefore not visited. The reported method of operation was as follows. Clinker previously burned was crushed and screened into 3 fractions. The finest portion consisting of unburned material was returned to the stream of dry raw mix and fuel being fed to the nodulizer. The next finest portion, consisting of particles 6 to 8 m.m. in size was placed on the traveling grates to protect them from the heat. A layer of 15 to 20 in. of nodulized mix plus fuel was then superimposed. The grate then moved under an ignition hood, where an auxiliary flame from a coal or gas fire ignited the mixture within a minute or two. Passage of the grate under this hood required enough time to start good combustion of the fuel in the upper layers of the mix-fuel bed. From here on combustion is induced by a series of draft boxes under the grates, and continues until all of the fuel is consumed and the clinker is cooled. Low fuel costs were reported for the equipment. A detail of the installation is given in Report II. The method should be investigated further when the equipment can be seen in operation. An output of 10 tons of clinker per day per square meter of grate is claimed.

A second grate of somewhat similar character has been patented by Dr. Nils Young (Norwegian) of Frankfurt, who holds German Patent 735258 on his modification, which consists of using a shuttle grate acting on the principle of a shaker conveyor. His grate is protected by a layer of limestone, which he claims is used to prevent the clinker from sticking. No commercial application of the patent has been made, and the scheme is considered impractical by the investigators.

Rotary Kiln Linings

Two new types of liner block were seen which merit trial. American producers of rotary kiln liners have recently been advocating abandonment of conventional liner shapes, in which the long dimension of the blocks is set in a circle, for an arch type brick in which the long dimension of the base is laid longitudinally in the kiln. The German brick producers have already adopted this new practice for fireclay, high alumina and magnesite blocks, and in addition have evolved an interesting modification. End blocks for junction with existing linings have 90 deg. ends, but the other face is inclined 10 deg. from the vertical. All of the normal blocks have a parallel slope on both up- and down-kiln faces. Alternate end blocks around the kiln section have opposite inclinations and alternate longitudinal rows are laid so that the slope of each row is reversed. This would appear to give better key-in of brick, but might make repair of old linings more difficult.

Magnesite liners made in the above shapes are manufactured by the Austro-American Magnesite Co. Radenthein, Carinthia, Austria, and mar-

keted under the trade name of "Radex." Both the magnesite grain and bonding agent in these blocks are dead-burned.

This Austrian company has produced another modification in lining to compensate for inability of magnesite linings to take the usual kiln coating. A fireclay brick of 5 cm. thickness is laid under four rows of magnesite liners, while the fifth row is set down 2½-3 cm. closer to the kiln shell, and supported by a cement-clinker mix.

This arrangement of built-in grooves in the lining prevents sliding of the kiln load on the brick, thus preventing wear. The thickness of the magnesite brick in the one lining of this type seen was 18 cm., giving a total thickness of lining 23 cm., except at the grooves.

The practice of placing thin steel plates between bricks in magnesite linings has been given up, and the brick are now set in a mortar consisting of magnesite brick meal and waterglass. Producers report excellent lining life for the method, when the kilns are of sufficient rigidity. It may be significant that several kilns were found with a line of stiffening bands around the kiln in the burning area, evidently to lessen flexure of the shell.

Another development of interest in kiln liners was a clinker-cement brick devised by Dr. Fritz Koeberich of the Heidelberger-Leimen Portland Cement Co. The idea of a liner made with portland clinker bonded by cement is old, but has not been satisfactory due to rapid decomposition of the brick and loss of about half the lining thickness whenever the kiln is cooled off. However, the Koeberich block is claimed not to develop this fault, and to yield a lining life of a year or better. The brick are made from graded size portland clinkers bonded with portland cement, and molded by tamping or by pressure and vibration. A mix of 1 cement to 3.5 to 4 parts clinker is used.

The form of the brick is the arch type. After molding and curing, the brick are placed in a ceramic kiln and subjected to a burning temperature of 1400-1500 deg. C, which converts the hydrated cement compounds back to the unhydrated clinker minerals. In this form the structure of the brick is not affected by periods when the kiln is cooled off. Both clinker and cement must be of low dicalcium silicate content, in order to prevent dusting and consequent disintegration of the brick during the slow cooling period in the ceramic kiln. It would appear that this method of producing kiln linings has considerable merit.

Several kilns were seen lined with clinker-cement concrete. This was considered purely as a temporary expedient, since the plants were out of liners suitable for the hot zones of the kilns. This type of concrete would have most if not all of the objections inherent in the old type of clinker brick.

Clinker Cooling (Rotary Kilns)

Clinker coolers were largely of the conventional rotary type. A few modifications were found. In one, the discharge end of the cooler had a small diameter inner tube for about one-third of the cooler length, and the space between this tube and the cooler shell was divided into compartments. Reasons for the innovation were not clear, nor were the possible benefits which could be derived.

Two "Schwing" coolers of a vertical type designed by Polysius were seen—one in operation. These were the pressure type, fed at top center from the kiln discharge, and having a rotary swinging motion on their vertical axis imparted by a motor and cam mechanism. Clinker being discharged by the one in operation was still very hot, and both plant operators expressed dissatisfaction with them from the standpoint of rapid wear and poor cooling.

Proportioning

In general, proportioning of clinker and gypsum was by crude methods, which would give rise to wide variations in gypsum proportions. Most proportioning was by volume from feed tables, even where fineness of clinker was variable and the rate of feeding would therefore vary widely. One installation was seen in which the clinker feed was a slide in a spout below a clinker bin, with gypsum added from a feed table. When granulated slag was added as a third component for production of eisenportland or hochofen cement, proportioning was equally crude. Only two plants out of those seen had modern proportioning by weight of clinker and slag.

Finish Grinding

Finish grinding is very generally done in conventional combination mills with either two or three compartments operating in open circuit. Cement finenesses were expressed in residue retained on the 4900 metric sieve (178 meshes/inch). No determinations of specific surface were made in any of the laboratories visited for control purposes, nor was equipment for the purpose seen. Fineness varied with the type manufactured, ranging from 10 to 14 percent residue for type 225, 5 to 8 percent for type 325, and claims of 2 to 3 percent for type 425.

Two plants were operating combination mills in closed circuit with modern air separators; a third had two Pfeiffer mills and one combination mill all in closed circuit. One plant had an unusual combination mill in which the last of three sections was divided into four equal quadrants, each with its own load of small balls for final grinding. The plant producing white cement used hard porcelain balls of high toughness. The hardness resembled that of Sillimanite.

Fuel Handling and Grinding

Coal deliveries to plants were generally unloaded by cranes with clam shell buckets. Hopper bottom railway cars were not seen. No provisions were seen to compact coal in storage to prevent spontaneous combustion, and no fires were found in stocks of stored coal.

Fuel for vertical kilns—coke breeze or anthracite screenings—was already fine when received, and generally no further reduction in size was made. Occasionally a small set of fine rolls was seen. Vertical kiln operators apparently used either fuel indiscriminately, but frequently used a mixture of the two.

Coal for the rotary kilns was generally ground in unit types of pulverizers, both the Lösche mill and Humboldt types being in use. One Humboldt unit had an electric precipitator for collection of the coal dust after the gas carrying it had passed the air separator and cyclone. Use of furnace gases for drying prevented explosions.

None of these unit pulverizers was direct connected with the kilns, as in U. S. practice. All producers stored the ground coal, preferring to run the mills at peak efficiency and then shut down when storage bins were full. Capacities of mills and ground coal bins were usually adjusted so that the mills would operate about 16 hr. out of 24.

Conventional coal screws arranged for variable speed were used generally. A few producers had somewhat elaborate multipitch feed screws which they claimed eliminated flooding.

Packing

All packing was done in either Bates or Modern packers, in paper sacks. No cloth sacks were found in any sack storage. The sacks for ordinary type cement (225) were usually only 2-ply, regardless of which sack breakage was small. Higher quality cement was packed in 4-ply sacks. The Kraft paper used in the sacks was of apparently normal weight, but had very good strength. Both sewed and pasted bags were in use. The end flaps of pasted sacks appeared to be lapped so that each pasted ply was stuck over a different area at top and bottom of the bag, which yielded a thinner and quicker drying end, with utilization of less paste. A single paper strip was pasted across each end for reinforcing.

(Continued in August issue)

Developing Maximum ROTARY KILN Capacity

By VICTOR J. AZBE*

NO SATISFACTORY ANSWER has been given to the question as to what should be the capacity of any particular rotary lime kiln. Many kilns are therefore operating at rather low rates, because a standard of performance which could be used in evaluation is lacking. Formulas were developed from dimensions which supposedly should have given the expected kiln capacity, but none of them are of any value.

A standard of performance is like a whip guiding and driving one to greater accomplishments. As this was lacking, it has resulted in virtually all rotary kilns operating below their possible range. At 40 instead of 60, at 150 instead of 200, at 200 instead of 300 tons. The larger they get, the greater becomes the discrepancy.

As the profit of a lime plant tends to increase in a geometric measure with the rise of capacity, a 25 percent increase in capacity, through improved operation rather than additional kilns, would have a tremendous economic benefit.

Up to a certain point a plant makes no profit; beyond that it does at an ever increasing rate and, while the average cost of making lime may be say $5.00 a ton, the last few tons, or the additional tons, often are made for just $2.00 and sometimes less.

If there is a market, a 25 percent difference in capacity may readily mean the difference between no profit and a good profit, between failure and success.

It is therefore extremely important to know positively, if the kiln is producing up to its ultimate limit, and while there may be other bottle-necks through the plant, the kiln usually holds back the entire operation.

First, one should be able to classify his operation, and from that usually the incentive will develop to proceed with the improvement.

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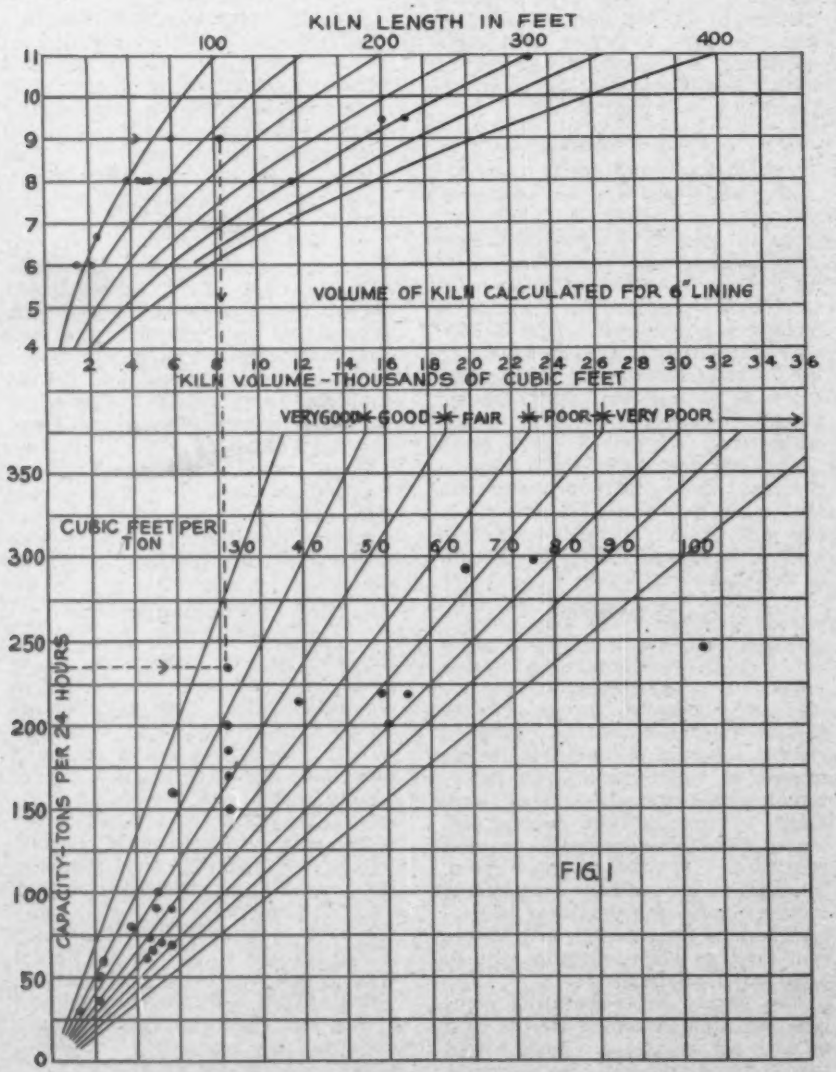


Fig. 1: Curves showing relation of rotary kiln volume to capacity

Kiln Capacity Rating

We have had an opportunity to study many rotary kilns. In these studies we had to consider many factors bearing on performance; such as the kiln size itself and size proportions, fuel admission and rate of combustion, stone-sizing and stone as it affects gas stratifications, kiln load and kiln rotation, and the effect of coolers and possible preheaters.

Through all this the conclusion has been reached that the evolution of a kiln formula is not such a complex problem after all. Simply expressed, whether the kiln is large or small, as long as it is not of some freak size, it should produce one ton of high calcium lime for 35 cu. ft. of kiln space measured within the lining.

We know of no normal kilns which operate consistently at 35 cu. ft. per ton of lime, but we know of kilns which operate at 37 cu. ft. per ton under handicaps which, if removed, would improve the performance to such an extent that the rate would be better than a ton for 35 cu. ft. However, a 37-cu. ft. rating is very good, and as we scan the field, anything between 30 and 40 cu. ft. could be rated as "very good" and for the rest the performance ratings should run as follows:

Cu. Ft. Per Ton	Performance Rating
30-40	Very Good
40-50	Good
50-60	Fair
60-70	Poor
70 and over	Very Poor

This evaluation system is presented graphically in Fig. 1 where the kiln volume is based on a 6-in. lining. Figures refer to specific plants, and of them all, the highest capacity in respect to size is that of The Warner Co., 9- x 175-ft. kilns at Bellefonte, Penn.; kilns without preheaters and only imperfectly equipped with coolers.

Of course there will be an immediate objection to such an evaluation system. Some will contend that it is inefficient to drive a kiln at such a high rate, but Bellefonte kilns have a better fuel ratio now, when running at the 37-cu. ft. rate with poorer coal, than previously when operating at 50 cu. ft. with better coal.

Others will contend that a large kiln cannot produce at the rate of a small kiln, and those operating small kilns will argue to the contrary. It is a fact that the figures show several large kilns of 70 to 80 cu. ft., rated "very poor" with one completely off the scale, but we believe that is due more to causes other than their size.

A study of the relation of kiln size to production involving a large group of cement kilns shows that on the average, kilns of 24,000 cu. ft. produce an equivalent ton of lime for 62 cu. ft. and those of 12,000 cu. ft. for 51 cu. ft., a relatively small difference. This variation we are not at all willing to ascribe to the size difference, but rather to such factors as: inadequacy of fuel admission, combustion imperfections, draft available within the kiln, and other factors, some of them only inherent to cement kilns.

In this discussion we are not criticizing the rotary as such, or entering the controversy on the subject of long versus shorter units. We shall even lean towards the longer units when a preheater is not installed, but it must be pointed out that the normal rotary lime kiln in operation today is short and our concern is to somehow stimulate a better production from them.

The following table deals with the short units of an approximate net diameter-to-length ratio of 1 to 21. It presents what the capacity should be when the arrangement is fair and operation good. It embraces only the "very good" and the "good" ratings. We are reasonably certain about the data, except only for the very largest diameters, in which, due to too thick a flame, radiations of the upper half may be unable to penetrate to the lime with sufficient readiness.

Size	Area Inside Lining Sq. Ft.	Net Volume	Vol. 30	Vol. 35	Vol. 40	Vol. 45	Vol. 50
6- x 100-ft.....	19.6	1960	65	56	49	43	39
7- x 125-ft.....	28.3	3540	118	100	88	78	70
8- x 150-ft.....	38.5	5780	192	165	144	128	115
9- x 175-ft.....	50.2	8790	294	250	220	195	175
10- x 200-ft.....	63.6	12720	420	360	315	280	250

To be anywhere within the tabulated data demands good operation, and to be high requires also good arrangement, but not necessarily special preheaters and coolers, which tend to throw the kiln into a separate category.

Combustion Conditions

In a rotary there are two main problems; one is heat generation, the other is heat absorption. If sufficient heat is not generated, we do not make the lime, if the heat is not absorbed, it spills over into the stack. Hidden within the problems of this very simple statement there is much physics.

First, taking it elementarily, we are concerned with the production of heat, and the more fuel we burn the more lime we make, but we must really burn the fuel and not in part merely inject it. We also must burn it in the earlier and not in the final portion of its travel through the kiln.

Rate of combustion depends on the presence of oxygen, atomization of the fuel, utilization of the available combustion space, on gas turbulency, and on the degree of air preheated.

When these conditions are poorly satisfied, the heat generating rate may be only 2 B.t.u. per second per cu. ft. of combustion space. If mixing is good and the air is preheated to 1000 deg. F. the rate may be as high as 20 B.t.u. per second. In some kilns of low capacity and poor gas mixing with combustion extending clear through the kiln, the rate is only 2 B.t.u. per second, while in good kilns, counting on combustion being complete in half the kiln, the desired rate is only 6 B.t.u.

So the question is definitely not that of physical ability to generate heat. The rotary, given an opportunity has not nearly reached its limits in this respect. With very hot compared to cold air, the combustion rate increases tremendously but in the main, it could be said of virtually all kilns that they receive cold air for combustion. Kilns may have lime coolers, but generally they are poor air preheaters, little of the sensible heat of the lime is returned to the kiln; seldom more than 30 percent, often none at all, reducing the combustion rate besides wasting heat.

The matter of combustion space utilization leaves much to be desired, seldom is a kiln cross-section filled out with flame, proving poor distribution of combustible. For example, on a short rotary kiln it was found that the combustible stream and the air stream passed clear through the kiln unmixed except at the contact point of the two streams. In the gas mixture tumbling out of the kiln, oxygen was very high and any effort to reduce it immediately resulted in large increase of CO. If the kiln had been long, the condition would not have revealed itself so readily, but it still would have existed, only the mixing and burning would have been consummated in the extra length, as is actually the case in virtually all kilns. Unfortunately this extra length is no longer the kiln proper; it is the stone preheating zone. Our interest should be to improve combustion in the calcining zone.

Conditions where the inside wall surface is cooler than the lime surface should not be allowed. It is hard enough to get the heat to the lime to re-radiate it and lose it. None of the re-radiated heat returns to the lime.

It was stated that heat generation and absorption must be in balance or too much is lost in the stack; also refractory troubles may become too serious. But any increase we are interested in requires only a relatively small rise in temperature, a rise of an entirely practicable degree. The radiation law helps us in this as the rate varies as the fourth power of temperature difference.

The rotary kiln flame of say 2700 deg. F. is not necessarily all of that temperature. Portions of it will be hundreds of degrees less, others several hundred degrees more, the lower temperature streaks being those which have not as yet received the full quota of oxygen and which may not be received until out of the calcining zone. The general mass of the flame is decidedly streaked, inhomogeneous, indicating poor mixing.

There may be scale trouble, but it is better to have scale than refractory trouble. It is not so serious anyway if the subject of shooting it out is mastered. With some companies scale is the worst bug-a-boo they have, while others like Marblehead Lime Company control it so readily that the front office hears little about it. The Cardox system works quite satisfactorily.

There is little art practiced in fuel combustion as applied to the rotary; there is no ready control over flame length and width, intensity, direction and turbulency. It is just applied and that is about all, although efforts are made here and there to better this state.

Draft and Draft Loss

To burn the fuel requires air, which requires draft. Draft is a most important factor, many kilns being held back due to insufficiency, with the operators completely unaware of this condition.

EDITOR'S NOTE: This article will be continued in the August issue of ROCK PRODUCTS.

Operating Trends

LOUISIANA—

A Sand and Gravel Producers Legacy

State has practically only one aggregate

By HERBERT E. SWANSON and NATHAN C. ROCKWOOD

IN at least one State, sand and gravel producers have practically no competition for the mineral aggregates, unless it is material shipped from outside the State. That State is Louisiana and it is more or less exclusively a fairly recent alluvial deposit, in which sand and gravel are, of course, common. The only exceptions are salt domes, occasionally covered with limestone cap rock, which have been thrust up through the alluvium. In only one such instance is a deposit of commercial material available.

Aside from oil and gas, sand and gravel are therefore the State's chief mineral resources, and they have received more attention from the State Geological Survey than is the case in most of the other States. Geological Bulletin No. 19, "The Sand and Gravel Deposits of Louisiana," by T. P. Woodward and Albert J. Gueno, Jr., published in 1941, might well serve as a model for other State Surveys in its arrangement and completeness. It contains a directory of all the possible commercial deposits, descriptions of the character of deposits and the locality, accessibility, amount of overburden, topography, and a sample screen analysis, specific gravity, etc. No producer or prospective producer in Louisiana should be without a copy of this Bulletin.

Definitions of "Sand" and "Silt"

Incidentally, this Bulletin contains definitions of "sand" and "silt," which may come in handy when producers are faced with the necessity of finding such definitions. Specifications, while distinguishing between sand and silt by the use of these terms, seldom actually define the distinction. According to the one given here: "The maximum size of sand grains is usually between ¼-in. and 1/10-in., and the minimum size from 1/150-in. to 1/1400-in. As used in this report, sand (fine aggregate) is of sizes that will pass Tyler Standard No. 4 sieve (0.187 in.) and be retained on the No. 200 sieve (0.0029 in.). Material coarser than 0.187 in. is classified as gravel (coarse aggregate), and smaller than 0.0029 in., as silt and clay."

The Bulletin also contains specifications for all the common industrial uses of sand and gravel, glass sand, filter sand, etc. The survey was made in cooperation with the Louisiana State Highway Department, and is essentially concerned with sources of highway construction materials. Only pits that were being, or had been, worked were examined; over 300 in all; and approximately 450 samples were taken and tested. Samples in most cases were composite materials stripped from the walls of a pit, or from hand-dug holes below the stripped part of the pit. In cases where the concentration of material varies considerably over the locality, two or more composite samples were taken. In flooded pits, pit-level and water-level samples were taken. In some instances unsegregated stockpiles were tapped for samples.

In the accompanying chart we have plotted washed concrete sand samples having the largest percentage passing No. 100 sieve and the smallest percentage. While not strictly comparable, because the percentages in the published tables are for the sand-gravel aggregate as a whole, and not, except in a few instances of the sand alone, the examples of the six sands chosen do give some idea of the range in sizes found in Louisiana. In most pits sampled the raw material ran from 20 to 40 percent removed by elutriation (clay and fine silt—material minus No. 200 sieve). Specific gravities vary from about 2.54 to 2.58; most of the commercial materials are apparently about 2.55, which means they are chiefly chert.

The chart shows that sands from all parts of the State have quite similar characteristics. All but two (Nos. 2 and 6) are deficient in material retained on No. 30 sieve, in other words they have too much passing No. 30. All but one are about right on the amount retained on the No. 50 sieve, and this one (No. 5) is not adequately washed; it would probably pass muster if some 10 percent of its "elutriated" material was removed. Four have enough retained on the No. 16 sieve. All but one barely got by on the material retained on the No. 8 sieve. The State Highway Department of Louisiana has no limits on the No. 8 and No. 30 sieves, so that the above remarks refer to the comparison with the usual U. S. Government specifications. It is obvious that these sands except No. 6 from the northwest corner of the State are finer than would be selected under other conditions. The lack in intermediate sizes could be compensated for only by wasting large amounts of other sizes.

At the Turkey Creek, La., plant of Gifford-Hill Co., Inc., an 8-in. counterflow pump on dredge sends pulp to primary washing plant. Large walking dragline in background strips overburden

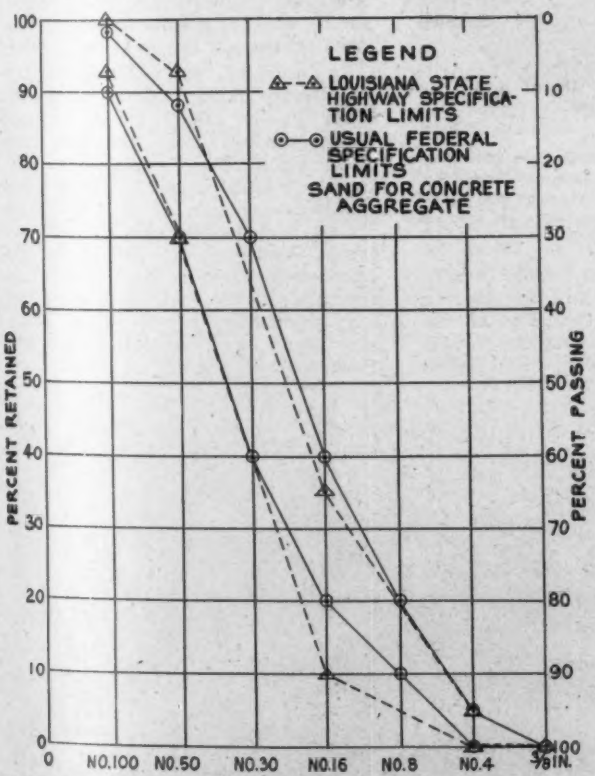
Geology of Deposits

Louisiana sand and gravel deposits are confined to areas covered by Pleistocene and Recent alluvial deposits. Tertiary outcrops, in the northwestern part of the State, are gravel-barren. Areas covered by the Pleistocene deposits are divided into topographical units; dissected uplands, containing the majority of gravel exposures, and the regions of low relief, which are almost gravel-barren on the surface. The Recent

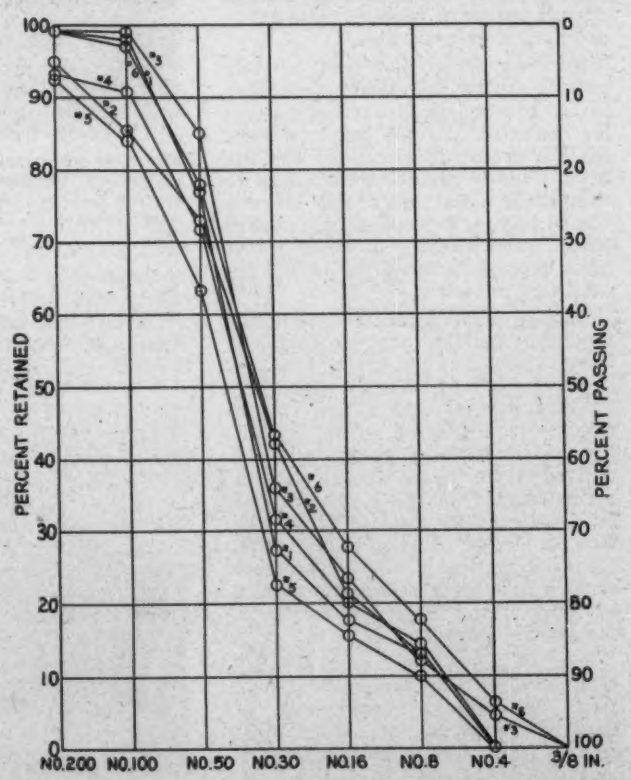
Overall view of operations at Rapides Gravel Co., Woodworth, La. Pipe line to the left feeds separation station, to the right. Main plant may be seen in the background to the left

alluvial deposits are also divided into two types; those related to the low-gradient streams with sandy flood plains, and those related to the high-gradient streams with graveliferous flood plains.

The graveliferous deposits of Pleistocene age overlying the Tertiary have been divided into four alluvial terrace deposits in central and north Louisiana. These were named, from youngest to oldest, the Williana, Bentley, Montgomery, and Prairie members. Facts indicate that the terraces were formed by four separate cycles of erosion and deposition. During each glacial stage, the sea level was lowered and a period of erosion set in. During each interglacial stage sea level rose, and resulting alluviation of the valleys formed a terrace surface in each case. Facts which indicate cyclic erosion and deposition show that the



Louisiana State Highway specification limits for concrete sand compared with Federal specification limits



Showing sieve analyses of six typical sands from various areas within the State. Note the similarity of characteristics

Dredge pumps material containing a high percentage of solids from relay station to main plant of Flint Gravel Co., Bluff Creek, La. Same dredge also pumps to relay station.

deposits and the valleys which they fill were definitely related to the changes in sea level accompanying the glacial and interglacial stages of the Pleistocene. Valley cutting was evident during each stage of low sea level, and the streams moved much coarse material as a result of the steepening gradient. The greater slope of the older terraces is explained by the assumption that the coastwise deltaic plains are underlain by thick deltaic deposits.

Most gravel deposits occur as lentils in the basal portion of the terrace deposits, but large gravel bodies are found in the upper parts of the deposits near the escarpments with higher terraces. Other commercial deposits occur in modern flood plains as channel concentrates.

Streams which had been actively cutting during the glacial stage were forced to aggrade their valleys as the ice retreated and the sea level rose. Stream gradients decreased and the heavily laden streams were forced to drop their load. As sea level continued to rise, deposits of coarse particles were shifted upstream, and finer deposits covered the previously deposited gravels.

Usually of much greater lateral extent and thickness are the marginal concentrates which mark alluvial fan development of high gradient streams flowing into a less steeply sloping mainstream flood plain. Streams transported coarse material derived from basal lentils to the mainstream flood plain where they built up gravelly alluvial fans. The tops of these alluvial cone gravel bodies occur near the present terrace surface and are the deposits worked by most of the larger companies in the central part of the State.

Secondary streams flowing directly onto deltaic plains also built alluvial fans. The great concentration of Bentley gravels in the central part of Rapides Parish (county) is representative of this type of fan.

Louisiana is divided into four gravel-iferous regions. The first, or central belt, extends from the west wall of the Mississippi Valley through Catahoula, LaSalle, Grant, Rapides, Evangeline, Allen, Vernon, Sabine, and Beauregard Parishes; the second

Two large gravity screens size two gradations of gravel at Washington Sand and Gravel Co. plant at Enon, La., loading cars on two tracks. Sand, collected in boxes, goes to cars on third track

includes the terrain east of the Mississippi River within the Florida Parishes; the third consists of the Mississippi and Ouachita River Valleys; and the fourth, the Bayou Dorcheat-Black Lake River gravel trend, is located in Webster, Bienville, Red River, northern Natchitoches, and western Winn Parishes.

The confluence of the Red and Mississippi Rivers has been located in the region of the central belt since early Quaternary time, and all of the terraces and their deltaic-plain equivalents are present in this part of Louisiana. Because of the proximity of the stream positions to base level, there was deep entrenchment of the terrace surfaces and the construction of marginal deposits of alluvial fan gravels in the Bentley and younger terraces. Modern flood plain gravels are not exploited in this belt except in western Vernon and Beauregard Parishes along the tributaries to the Sabine River.

The Florida Parishes may be divided into two general topographic units: the northern or Pleistocene dissected upland belt, 10 to 20 miles wide paralleling the east-west Mississippi border, and the southern low-lying alluvial terraces, and flood and deltaic plains. Exposures in the upland portion are similar to those in the central belt. The great quantity of gravel in this region was deposited in the flood plains of the Prairie and Recent times.

In the eastern part of the Florida Parishes most of the gravel production comes from the Prairie and sub-Prairie levels within the valleys of the Pearl and Bogue Chitto Rivers, while in the western Florida Parishes, the flood plains of the Tangipahoa, Amite, and tributaries of the Mississippi Rivers are the most productive.

In addition to deposits of the Mississippi flood plain, the Mississippi Valley gravel trend includes those worked from the Ouachita flood plain, the Prairie, and sub-Prairie terrace deposits, which flank the western side of the Ouachita Valley in Ouachita and Union Parishes. Deposits are found in the Mississippi River mostly as bars immediately below the mouth of tributary streams. Recent deposits are also found in the east bank of Boeuf River, an old channel on the Missis-

Material haulage unit with a capacity of 11 cu. yd. carries aggregates to ramp for loading railroad cars, Braswell Sand and Gravel Co., Minden, La.

sippi flood plain, in the southern tip of Richland Parish. Channel concentrates in the Ouachita River have been worked as far south as northern Catahoula Parish. Prairie deposits are exposed east and southwest of Monroe and in eastern Union Parish. Small commercial gravel deposits of sub-Prairie levels are found west of Monroe, and west of Sterlington. They are associated with small amounts of silt and clay overburden.

A large quantity of gravel is obtained from a belt of exposures in Webster, Bienville, Red River, northern Natchitoches, and western Winn Parishes. They follow the narrow north-south Quaternary alluvial valleys tributary to the Red River from the north. The most extensively worked of these deposits are in the valley drained by the Bayou Dorcheat in Webster Parish. Commercial deposits are worked north of Minden, where the thin basal lentil remnants of higher terraces cap Tertiary hilltops. South of Minden, along Bayou Dorcheat, exposures are thicker, more abundant, and more widespread, and commercial deposits are found both in the main stream valleys and for a short distance up the tributary valleys where each of the post-Williana formations is exposed. In Red River and western Natchitoches Parishes, most of the out crops are either of Montgomery or Bentley age and run parallel to Black Lake River and its principal tributaries.

Resume

Sand and gravel deposits in Louisiana are composed almost entirely of chert, quartz, and related silica minerals. The percentage of each in the deposits does not vary greatly in different sections, but quartz is more abundant in the Florida Parishes than in the western part of the State.

Structure supporting triple-deck screen at Alexandria Sand and Gravel Co., Woodworth, La. Sized gravel drops directly to cars with fines going to waste through pipe

New dredge of Rapides Gravel Co. pumps 75 per cent solids through 10-in. line to separation station 700 ft. away

Separation station places gravel and sand in stockpile for rehandling by dredge at left

Thus the physical and chemical properties are somewhat constant over wide areas and any major variations are due to local conditions.

With few exceptions, deposits are confined to areas of Pleistocene and Recent alluvial sediments which have been uplifted and dissected so that the basal gravel-bearing strata have been exposed. For the most part, Recent deposits are associated with the reworking of the elevated Pleistocene deposits by high-gradient secondary streams. In general, the area of exposures is confined to a belt through central Louisiana from the Sabine River on the west to the Pearl River on the east with additional trends extending up the major streams to the north.

Individual deposits show definite relationships with the depositional history of the formation in which they occur. Probably the most widespread of these deposits are the lenticular concentrates associated with the initial deposition of each formation; but in respect to size, they are much less important than the marginal alluvial cone concentrates which mark abrupt changes in grade of the alluvial streams.

About 99 percent of the sand and gravel produced in Louisiana is used in construction, the remaining being allotted to manufacturing.

Limestone

Outcrops of calcite cap rock underlain by gypsum and anhydrite occur at Winnfield and Pine Prairie. The cap rock overlies a salt plug and is the result of alteration of residual material dissolved from the salt. Since the calcite cap rock is the result of residual accumulation and alteration, it is highly irregular in character and badly broken. The cap rock is, therefore, not usable as a building stone. The only commercial exploitation of calcite cap rock is at the Winnfield dome where there is a crushing and screening plant operated by the Solvay Process Company for the reclamation of kiln stone and tailing which are sold as commercial stone.

The limestone cap rock occurring at Winnfield and Pine Prairie consists of cavernous and somewhat broken, coarsely crystalline calcite, with irregular light and dark-gray bands. The product is fairly uniform in composition, ranging from 92 to 98 percent calcium carbonate. Clay and sand have filtered into the cap rock from adjacent sediments in places, and gypsum extends well up into the calcite in parts of the deposits.

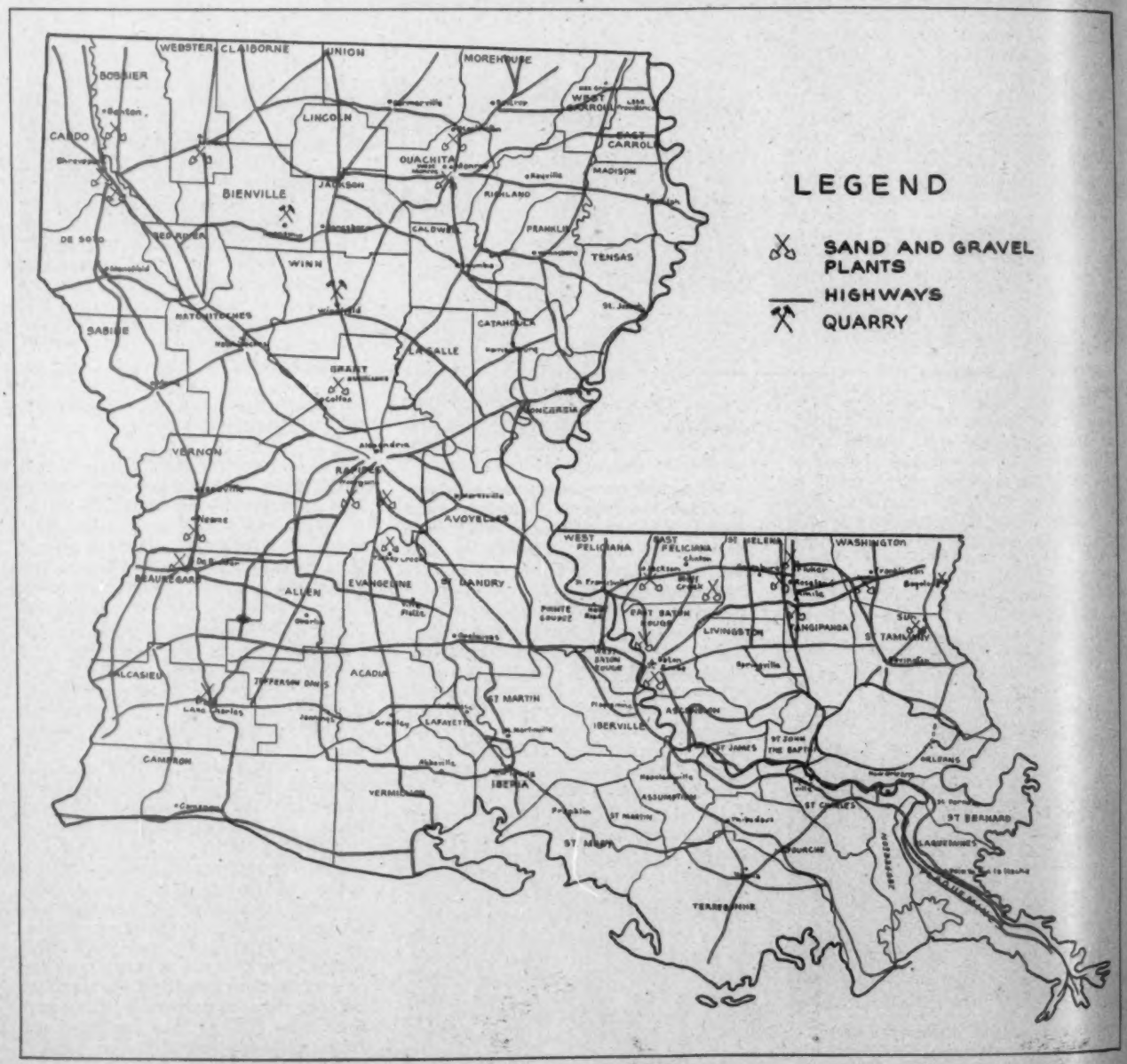
HIGHWAY SPECIFICATIONS

New Louisiana State Highway specifications issued in 1946 incorporate several changes from the one issued in 1940. Provisions are made in the new specifications for the use of ready mixed concrete, but do not allow the use of transit mixed concrete. Adoption of a new design requires that base courses be laid the full width of the road bed as compared to the old method of placing material in a trench. One of the more radical changes is the elimination of side borrow ditches by hauling in all embankment materials from cut sections or from borrow pits removed from the right of way. Also included in the changes are more detailed specifications for portland cement.

Base Course

Base course materials consist of the following aggregate: crushed stone, washed gravel, washed sand gravel, sand clay gravel, iron ore, clam shell and reef shell. Depth of the base course varies as to location of the job and is specified in plans for that job. Existing surface is scarified for the full width of the proposed base course and to a uniform depth below the proposed finished surface as will eliminate all depressions and irregularities. For all types of base courses other than shell bases, where the total loose depth of material to be compacted is 5 in. or more, it is spread and compacted in two or more courses of equal depth, not to exceed 5-in. depth for each course. Shell base is spread and compacted in one course regardless of depth.

Prior to compacting, the base course is watered and given a preliminary rolling. Any irregularities that develop under rolling are corrected by scarifying and adding or removing base materials until the surface presents a smooth appearance. Between rollings, the surface is machined, and rolling, machining, and watering continues until the material is thoroughly compacted.



Map of Louisiana showing location of sand and gravel plants and the relatively few quarries in the State

Portland Cement

Louisiana State Highway Department specifications for portland cement covers six types, as follows:

Type 1—For use in general concrete construction when the special properties specified for types 2, 3, 4 and 5 are not required.

Type 2—For use in general concrete construction exposed to moderate sulfate action, or where moderate heat of hydration is required.

Type 3—For use when high early strength is required.

Type 4—For use when low heat of hydration is required.

Type 5—For use when high sulfate resistance is required.

Type 6—For use in white concrete and white mortar.

Each of the six types shall conform to the following chemical requirements:

	Type 1 and 6	Type 2	Type 3	Type 4	Type 5
Silicon Dioxide (SiO_2) min. percent		21.0			24.0
Aluminum Oxide (Al_2O_3) max. percent		6.0			4.0
Ferric Oxide (Fe_2O_3) max. percent		6.0		6.5	4.0
Magnesium Oxide (MgO) percent	5.0	5.0	5.0	5.0	4.0
Sulfur trioxide (SO_3) max. percent	2.0	2.0	2.5	2.0	2.0
Loss on Ignition, max. percent	3.0	3.0	3.0	2.3	3.0
Insoluble residue max. percent	0.75	0.75	0.75	0.75	0.75
Ratio of Al_2O_3 to Fe_2O_3	0.7 to 2.0			0.7 to 2.0	
Tricalcium silicate ($3CaO \cdot SiO_2$) max. percent		50		35	
Dicalcium silicate ($2CaO \cdot SiO_2$) min. percent				40	
Tricalcium aluminate ($3CaO \cdot Al_2O_3$) max. percent		8	15	7	5

Portland cement of all six types shall conform to the following physical requirements:

	Type 1 and 6	Type 2	Type 3	Type 4	Type 5
Fineness, specific surface sq. cm. per gram					
Average value, min.	1600	1700		1800	1800
Minimum value—any one sample	1500	1600		1700	1700
Soundness: Autoclave expansion max. percent	0.50	0.50	0.50	0.50	0.50
Time of setting (alt. methods) Gillmore test: Initial set min. not less than	60	60	60	60	60
Final set, hour, not more than	10	10	10	10	10
Vicat test: Initial set min. not less than	45	45	45	45	45
Final set, hour, not more than	10	10	10	10	10
Tensile strength, psi: The average tensile strength of not less than 3 standard mortar briquettes composed of one part cement and 3 parts standard sand, by weight, prepared in accordance with Method C-77, shall be equal to or higher than the values specified for the ages indicated below: One day in moist air			275		
One day in moist air, two days in water	150	125	375		
One day in moist air, six days in water	275	250		175	175
One day in moist air, 27 days in water	350	325		300	300
Compressive strength, psi: The average compressive strength of not less than 3 mortar cubes composed of one part cement and 2.75 parts standard sand (graded), by weight, prepared in accordance with Method C-109, shall be equal to or higher than the values specified for the ages indicated below: One day in moist air			1300		
One day in moist air, two days in water	1000	750	3000		
One day in moist air, six days in water	2000	1500		800	1000
One day in moist air, 27 days in water	3000	3000		2000	2200

White portland cement shall conform to the requirements specified for Type 1, except that the color shall be white.

Fine Aggregate

Fine aggregate shall consist of clean, hard, sound durable particles of stone or sand, and shall be free from clay, loam or other foreign matter.

Types A, B, and K, for concrete or asphaltic concrete shall be subjected to the colorimetric tests for organic impurities and those producing a darker color than Fig. 3 of A. S. T. M. Designation C-40 shall be rejected. These types shall be subjected to the A. S. T. M. Designation C-109 for mortar strength and shall have a minimum strength of 95 percent of the standard mortar strength. These types shall not exceed the following percentages by weight of deleterious substances:—

Removed by decantation..... 3.0
Coal or lignite..... 0.25
Clay lumps..... 0.5

Fine aggregates shall conform to the following sieve analyses:

TYPE A

Sq. Opening Sieve	Percent Passing
⅜ in.	100
No. 4	95 — 100
No. 16	65 — 90
No. 50	7 — 30
No. 100	0 — 8

TYPE B (Sand for Mortar)

Sq. Opening Sieve	Percent Passing
No. 8	100
No. 50	15 — 40
No. 100	0 — 10

TYPE K

Passing No. 10, Retained on No. 40	10 — 40
Passing No. 40, Retained on No. 80	20 — 45
Passing No. 80, Retained on No. 200	12 — 32
Passing No. 200	10 — 20

Coarse Aggregate

Types A, B, C, D, E, and F are listed in the Louisiana specifications for coarse aggregate for concrete, which may consist of gravel and/or crushed stone. The gravel must be clean, tough, and durable, free from sticks, and clay coating. It shall not contain more than 15 percent of thin or elongated particles and shall have a percent of wear of not more than 15 by the Deval abrasion test. The maximum amounts of deleterious substances shall be as follows:

	Percent by weight
Removed by washing	0.5
Clay lumps	0.5
Soft fragments	0.5
Iron ore (included in soft fragments) retained on ¾-in. sq. opening sieve	0.5
Passing ¾-in. sq. opening sieve	1.0
Coal and lignite	1.0
Total clay lumps, soft fragments, coal and lignite	5.0

Crushed stone shall be obtained from clean, tough, sound, durable stone. Particles shall be free from dust, vegetable, or other deleterious matter, and shall have a percent of wear of not more than eight by the Deval abrasion test. It shall not contain more than 15 percent of thin, elongated particles and not more than three percent by weight shall be removed by washing over a No. 8 sieve.

Coarse aggregates shall conform to the following gradation requirements:

Sq. Opening Sieve	Percent Passing Type A	Type B
2-in.		100
1½-in.	100	85 — 100
1-in.	90 — 100	
¾-in.	40 — 85	40 — 85
No. 4	0 — 5	0 — 5

Types C and E may be composed of a mixture of two sizes of aggregates and individual gradings of the two sizes of aggregates shall conform to the gradation specified for the combined mix, and the two sizes shall be stockpiled and binned separately.

The combined mixture shall conform to the following gradation requirements:

Type C	Type E	Percent Passing
2¼-in.	2½-in.	100
2¼- to 1-in.	2½- to 1½-in.	25 — 40
1- to ½-in.	1½- to ¾-in.	20 — 45
½-in. to No. 4	¾-in. to No. 4	20 — 35
Passing No. 4	Passing No. 4	0 — 5

Individual sizes of aggregate for Type C and E, unless otherwise specified, shall be restricted as follows: The smaller size aggregate, for Type C, shall not have more than 10 percent retained on the ¾-in. sieve, and for Type E, shall not have more than 10 percent retained on the 1-in. sieve, not less than five percent on the ¾-in. sieve and not more than eight percent passing the No. 4 sieve. The larger size for Type C shall not have more than 20 percent passing the ¾-in. sieve and for Type E shall have 45 to 60 percent retained on the 1½-in. sieve and shall not have more than 20 percent passing the 1-in. sieve.

Types D and F shall conform to the following gradation requirements:

Sq. Opening Sieve	Percent Passing Type D	Type F
2¾-in.		100
2½-in.	100	90 — 100
2-in.	90 — 100	
1½-in.		40 — 100
1-in.	40 — 80	
¾-in.		0 — 25
No. 4	0 — 5	0 — 5

PLANT PRACTICES

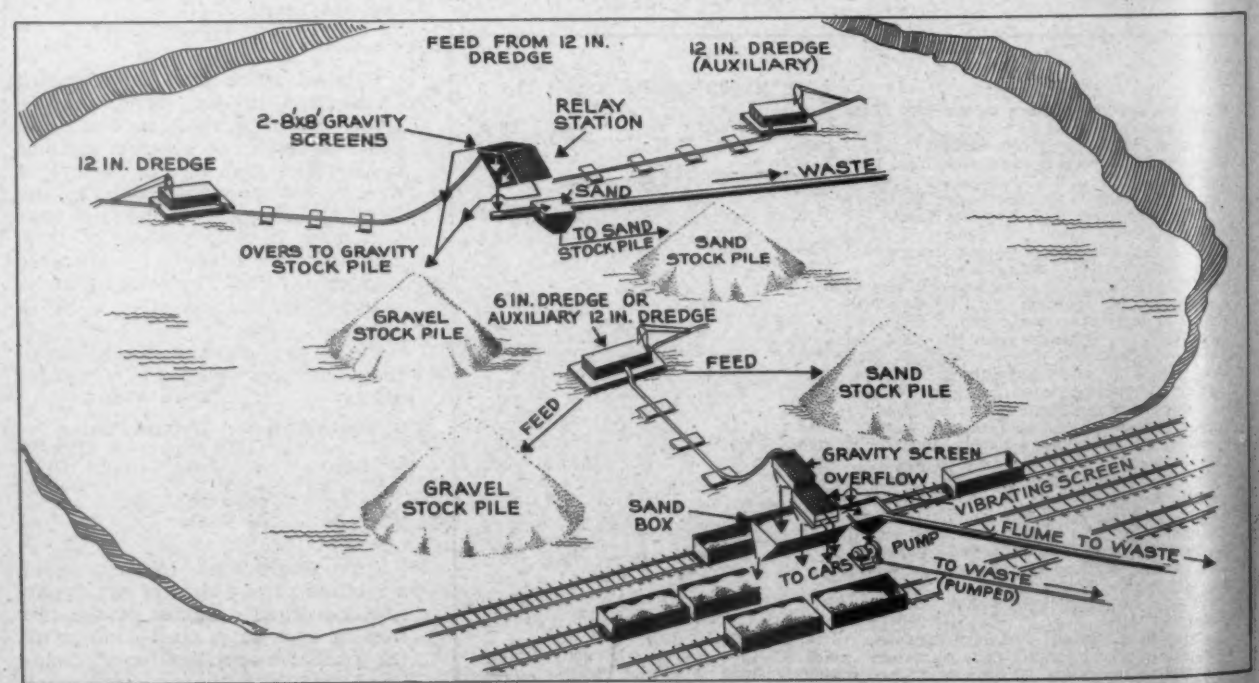
PRESENCE of excess silt and clay in the sand and gravel deposits of Louisiana has necessitated introduction of methods for its removal to meet specifications for concrete aggregates. Most common is a system of rehandling, which also serves the purpose of collecting the aggregates so that a greater percentage of solids may be pumped to the main screening plant. While the majority of the sand and gravel plants rehandle through a relay station, some also operate log washers and picker belts to assist in removal of objectionable material.

Surface water rises to within a few feet of ground level throughout the State, so that dredging operations are employed almost exclusively. Some plants strip overburden, eliminating much of the clay, as well as grass roots, sticks, and trash, while many run the entire deposit through the plant, necessitating methods of removing this objectionable material. As in the neighboring States of Alabama and Mississippi, the deposits are composed of a greater percentage of sand than gravel, so that much of the pumped deposit is wasted.

Standard Gravel Co., Franklinton, is working a bank deposit with dredge pumps and employs a system of rehandling to clean the aggregates. The accompanying sketch shows the layout of the plant, which features a method of operation whereby pumping can continue independently of screening operations. A 12-in. Amsco counterflow pump feeds a relay station where preliminary separation of sand and gravel is made. To augment feed from this pump, an auxiliary 12-in. Amsco pump is available. Two 8-x 8-ft. gravity screens at the relay station are placed in the shape of an inverted V, so that the head at which the pumps must operate is kept at a minimum. Feed from the pumps is split to the two screens, and oversize (gravel) drops into a stockpile in the pond. Sand passing the screens is laundered to a settling box, and the overflow is wasted back into the pond. Bottom discharge from the settling box is to a sand stockpile on the other side of the relay station. Aggregates from either stockpile, reclaimed by a 6-in. Amsco pump, are sent either to final screening at a loading tipple, or to other stockpiles when shipments are not being made. The auxiliary 12-in. pump can be moved to assist the 6-in. pump when larger feed is desired to the second stockpiles or to the screening tipple. The double stockpile system not only gives the aggregates an extra washing, but also assists in continued pumping operations when the final screening operations are idle.

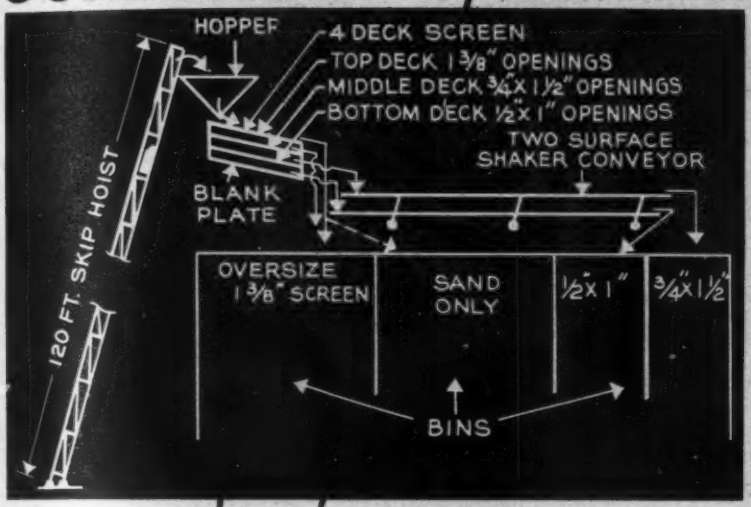
For secondary sand separation and gravel sizing, material passes over a single gravity screen at the loading tipple, throughs dropping to a sand box and gravel going to a double-deck vibrating screen. Sized gravel is chuted to railroad cars on either of

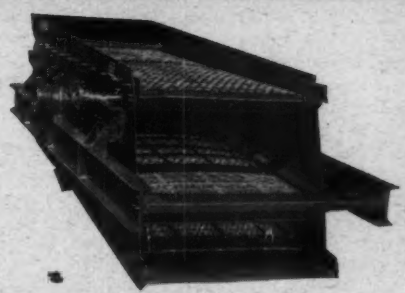
(Continued on page 90)



Dredge operation and screening arrangement of Standard Gravel Co., Franklinton, La. Three dredges are operated in a relay arrangement

A tough SCREENING PROBLEM





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Recently the Fred Schmitt Material Co., St. Louis, Mo., asked Simplicity engineers to set up a gravel separation system to feed into 120 foot silos. This meant skip-hopper feeding rather than the usual continuous belt type feed. Dangers of clogging and screen damage from heavy material impact were much greater than in the usual installation.

Simplicity's solution, the Model D Simplicity Screen, 3'x10', with solid plate fourth deck, shown in the accompanying diagram, resulted in perfect material flow at rate of one 5,000 pound skip load every 80 seconds — even though at times, 80 per cent of material passed through ½x1 inch screen on third deck.

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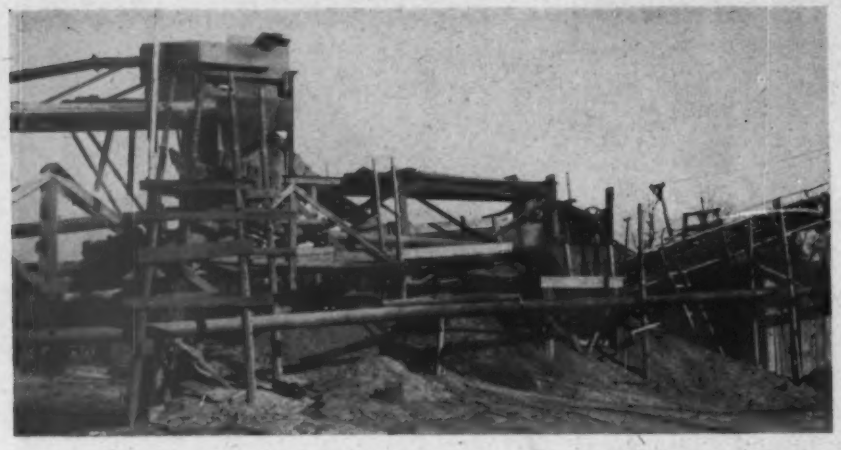

Box at top, left, receiving solids from stockpile at relay station, discharges over gravity screens with gravel dropping to log washer. Belt conveyor, right, moves washed gravel to screens at loading tipple; Alexandria Sand and Gravel Co., Woodworth, La.

(Continued from page 88)

three tracks below the tipple. Sand is sent from the box directly to cars, and overflow is either laundered to waste nearby or is captured in a box and pumped to waste a distance of about 1000 ft. to keep the area around the loading tipple clear.

In addition to rehandling, the Gulf Sand and Gravel Co., Amite, La., places material through a log washer before final sizing. The deposit is pumped by an 8-in. counterflow pump directly into a 10-x 20-ft. double log washer, which discharges to a stockpile in the pond, where it is given the second washing. The product from the stockpile is picked up by a 6-in. pump and sent to the screening plant, passing over a 5-x 10-ft. gravity screen for sand separation. Oversize drops to another 5-x 10-ft. gravity screen for sizing, concrete and pea gravel dropping directly into railroad cars under the plant. Sand passing the first screen is laundered to a sump where it is reclaimed by a dragline and loaded into railroad cars as concrete sand. When mason's sand is produced, a sand recovery box in the launder catches the desired size through a screen placed above the box. It is possible, of course, to place a plate over the box and allow all of the sand to go to the sump pit when extra fines are required in the concrete sand.

Trash Remover

The Charles Black Sand and Gravel Co., Fluker, La., does no stripping and reclaims overburden with the underlying gravel. There is a considerable amount of sticks and trash also pumped, and to get rid of this objectionable material, a trash remover is employed. This piece of equipment, invented by H. H. Holloway of the Holloway Sand and Gravel Co., receives the feed from a 10-in. pump directly from the deposit. It consists of a cylinder placed above an old 10-in. pump shell connected to the pipe from the dredge pump. Pulp entering the shell is given a swirling action as it circles the shell causing the lighter particles of sticks, grass roots, and other trash to rise to the top of the cylinder and overflow to a waste launder, while the heavier sand and gravel drops through a funnel at the bottom of the shell into a stockpile in a sump pit. To reclaim any fine sand that may rise in the cylinder, a sand recovery box has been placed in the launder. Discharge from the sand box is to the sump pit where it joins the sand and gravel that has passed through the shell. The product from the stockpile is picked up by an 8-in. pump and sent over gravity screens for sand separation and gravel sizing. Sand is collected in boxes, and gravel is sized into three sizes by a series of gravity screens.

Flint Sand and Gravel Co., at Bluff Creek near Grangeville, La., pumps a 35-ft. strata with varying overburden, with a 12-in. Amsco pump to a relay station for rehandling. At this station, the material is sent over a 6-x 10-ft. gravity screen with ⅜-x 1¼-in. rectangular openings, oversize dropping to a stockpile in the pit and the throughs going by flume to a 2-cu. yd. sand box, overflow going to waste. The product from the sand box also joins the material in the pit stockpile. When a large enough stockpile has been built up, the same dredge moves to the stockpile area and pumps to the main screening plant. Aggregate is pumped to three 3-x 7½-ft. gravity screens in series, each one slightly in advance and below the preceding one, with each of the screens having ¼-x 1-in. openings. Oversize from the gravity screens drop to a triple-deck, 4-x 12-ft., Tyler Niagara vibrating screen with 1¼-,⅝- and ⅜-in. square openings on the three decks, respectively. Gravel retained on the three decks goes to bins, while sand passing the lower deck joins sand passing the gravity screen and is sent over an apron to a launder. The launder passes over two sand bins, with 3/16-and ⅜-in. screens above the two bins for recovery of mason's and concrete sand. Overflow is flumed to waste.

Increase Dredge Capacity with Jet System

To increase capacity, and to provide a steady flow with a greater percentage of solids through the dredge pumps, H. H. Holloway, president of the Holloway Gravel Co., has installed a jet system on dredges at two

(Continued on page 92)

At Black Gravel Co., Fluker, La., solids enter shell of trash collector, upper right, receiving a centrifugal motion that sends lighter particles into cylinder to overflow in launder at left. Heavier gravel drops to stockpile, below, by chute. Box at left recovers sand that floats out through cylinder, overflow (trash) going to waste

OUTSTANDING ability of Firestone Earthmovers to furnish maximum flotation for capacity loads is recognized by earthmoving contractors the world over. Designed for free-rolling wheels of scrapers, tractor and trailer wagons and buggies, the low pressure Earthmover with its large cross sectional diameter rolls easily over sand, loose fill and gumbo. The extra tough, cut-resistant tread design keeps heavily loaded units from side-slipping or skidding on side hill hauling. The tire body, made of heaviest, strongest rayon has *four extra tread plies* to cushion impact blows which cause failure in less rugged tires. Double thick sidewalls protect against rutwear and snagging. *Firestone Earthmover tires, working for you on your equipment, will cut your operating time — and costs — to the minimum.*

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Firestone OFF-THE-HIGHWAY TIRES

(Continued from page 90)

of his plants, the one at Jackson, La., and the other, the Rapides Gravel Co., at Woodworth, La. This pump jet, developed and patented by Mr. Holloway, operates on the injector principle and consists of a straight extension to the dredge suction pipe, which has an elbow at its lower end so that when in a pumping position, the jet extension is approximately in a vertical position.

The position of the extension in the suction pipe is governed by screwing it into place so that the end of the extension in the pipe will provide the proper opening for the water to pass through. In advance of the end of the extension is an inner ring, which narrows the inside diameter of the suction pipe at this point. The extension is screwed into the suction pipe far enough so that the opening or venturi between the end of the extension and the inner ring will be about ¼-in.

Connecting the jet pipe and the suction pipe is a cylinder through which water is forced. The water goes through the ¼-in. opening causing a suction at the open end of the extension in the deposit. While most of the water goes through this cylinder to produce a suction in the pipe, some of it goes through the end of the pipe which is tapered down to a 1½-in. nozzle. This water lubricates the material directly ahead of the suction pipe, thus preventing choking of feed and helping to provide a constant flow through the suction pipe.

Relay Method of Dredge Operation

At the Jackson plant, there are two dredges pumping material to a relay station for primary washing. One dredge has a 12-in. suction and 10-in. discharge pump equipped with an 8-in. water line delivering water at 65 p.s.i. The second dredge, with a 10-in pump has a 6-in. water line delivering water at 60 p.s.i. The product picked up from the relay plant and sent to the main plant is handled by a 12-in. pump with an 8-in water line developing 85 p.s.i. With a 100 percent increase in power requirements by the use of jets, an increase of about 300 percent in capacity has been achieved.

Product sent to the relay station is sized over a 5-x 15-ft. gravity screen equipped with ⅜-x ¾-in. openings. Oversize is sent to a stockpile under water while throughs are sent to waste. Product from the stockpile is picked up by the 12-in pump and sent to the main plant with the assistance of a 10-in. booster pump located about midway in the line. This booster pump, in addition to speeding flow through the line, also helps to break up any mud and clay balls and gives the gravel an additional washing.

Discharge from the pump is into a trash box located at the top of the plant. This trash remover is the same as that used at the Black Sand and Gravel Co., described earlier in this article. Gravel cleaned in the trash box drops through an opening in the bottom and is sent over a spreading table to three sets of three gravity screens. The top set, with 1⅜-in. openings scalps off the larger gravel, throughs dropping to another set of three screens with ¾-in. openings. The lower set is equipped with ¾-x ⅜-in. openings. Passing this lower set, material goes to a spreader table and then to a launder, containing two sand boxes. The boxes are covered with screen mesh to produce mason's and concrete sand.

Capacity of this plant is about 500 tons of gravel and 100 tons of sand per hour.

Also using the jet system is another plant owned by Mr. Holloway, at Woodworth, La., known as the Rapides Gravel Co. Deposit is pumped from a stratum averaging from 35-to 60-ft. of gravel with a 10- to 50-ft. overburden. The entire bank is put

Portable desanding plant mounted on double flange steel wheels operates over standard gauge track, Gifford-Hill & Co., Inc., Turkey Creek, La.

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Operating Trends

(Continued from page 92)

through the line to the plant. Since some of the bank is composed of hard material, it has been found necessary to blast it down at times. From 50 to 80 sticks of 40 percent dynamite are tied together and lowered into the water next to the bank and shot with caps. About one car of material can be shot down with 10 sticks of dynamite.

Deposit is pumped through the 10-in. pump equipped with an 8-in. water line hooked in series with the gravel pump. The pump has an 83-ft. 9-in. suction pipe. An average of 75 percent solids is pumped through a 700-ft. line to a relay station with the assistance of the jet. The relay station has a 9-x 12-ft. gravity screen with ⅜-in. square openings to separate the gravel from the waste. Gravel falls to a stockpile under water where it is picked up by a 10-in. Amsco pump for delivery to the main plant. Waste is sent through a flume to an area about 300 ft. away, where it is picked up by a 10-in. Amsco pump and sent to a waste disposal area about 1600 ft. distant. Installed in the flume which carries the fines to waste, is a 6-cu. yd. capacity sand box, which reclaims sand and sends it into the gravel stockpile.

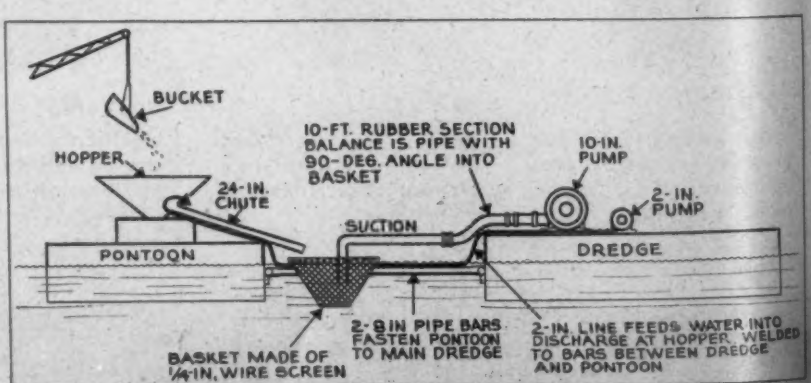
Solids sent to the main plant are boosted by an 8-in. Amsco counterflow booster pump, elevating 56 ft. to the top of the plant. It is estimated that the booster pump increases production by about 50 percent. Feed to the plant goes into a pump shell acting as a collecting box. A 32-in. diameter opening at the bottom of the shell feeds to a spreading table, 6 ft. wide at the feed end, 20 ft. wide at the discharge end, and 7 ft. long. The table discharges over a 20-x 20-ft. scalper screen equipped with 1½-in. square openings, oversize dropping to a waste bin. Throughs drop to a set of three 9-x 20-ft. gravity screens in series, with ⅜-,⅝- and ¾-in. square openings on the three decks. Oversize from the first deck drops to the second, oversize from the second to the third, and from the third into a bin. Gravel passing the two lower decks also is sent to bins, while throughs from the top, or ⅜-in., deck, is flumed over two 6-x 12-x 12-ft. sand boxes, with screen mesh on the two boxes, for the recovery of concrete and mason's sand. Overflow is laundered to waste.

Dredge of Holloway Gravel Co., Jackson, La., has jet line connected in series with suction line to increase percentage of solids pumped through pipe

For the production of specification material, a 4-x 10-ft. Niagara double-deck vibrating screen is used. Gravel from the bins containing the two middle sizes can be sent by chute to this screen, having screen mesh necessary to produce the desired size. This product as well as the gravel in the bins, goes to cars on two tracks underneath while sand goes to cars on two adjacent tracks. Production capacity is about 200 tons of gravel per hour.

Use Log Washers

Alexandria Gravel Co., Alexandria, La., in addition to rehandling, also washes out clay balls and objectionable material by sending it through log washers. A 10-in. Amsco pump moves material in the deposit to a relay station with a 10- x 10-ft. gravity screen, ⅜-in. square openings.



Unusual method of handling material to plant at Braswell Sand & Gravel Co., Minden, La. Dragline deposits material in hopper, mounted on pontoon, from which it is sluiced by chute into wire basket supported by sections of pipe. Material is drawn from basket by connecting dredge pump

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(Continued from page 94)

Throughs laundered to a waste area are picked up by a crane and loaded to trucks when there is a demand for sand. Oversize drops to a stockpile under water, where it is picked up by another 10-in. pump and sent to the main plant. Discharge is over a 5-x 7-ft. and a 6-x 9-ft. gravity screen with 3/8-in. square openings on both screens. Throughs are sent to waste, and oversize drops to an Eagle double log washer, 24 ft. long. Overflow is wasted and the product from the logs is sent to a belt conveyor moving it to a 4-x 10-ft. triple-deck vibrating screen for sizing. The top deck is equipped with 2-in. square openings to scalp off iron ore, while the other three sizes are chuted directly into railroad cars for shipment.

Braswell Sand and Gravel Co., Minden, La., has recently reopened its plant, after a shutdown during the war years. A unique method of handling will be installed here within the next few months. Deposit will be reclaimed by a Northwest dragline with a 1¼-cu. yd. bucket, and loaded into a hopper set on a pontoon in the pit. Product from the hopper will go by chute to a basket made of ¼-in. screen partially submerged in the pit and attached to two lengths of 8-in. pipe which also secure the hopper pontoon to the dredge. The suction from the dredge will be placed in the basket and will pump to the main plant. A 2-in. pump on the dredge will send water to the discharge end of the hopper to agitate the product and send it at a uniform flow into the chute feeding the basket. The designer believes that this method of recovery will not only give the material a good washing and get rid of excess fines, but will also concentrate it in the basket so that it can be pumped to the plant at a greater amount of solids. It is felt that without the use of the basket, solids would spread around the pit and much could not be recovered by the

At Minden, La., plant of Braswell Sand and Gravel Co., the hopper, above, is filled by crane and discharges to two triple-deck screens for sizing aggregates. Gravel drops into bins, and sand launders to boxes

pump without too much movement.

At this deposit, there is about 12 ft. of overburden covering an 8-ft. stratum of gravel. The overburden is stripped by a 2-cu. yd. P & H dragline and wasted. Gravel pumped by the dredge is sent to a stockpile adjacent to the main plant. Stockpiled material, which is under water to give the material another washing, is picked up by the Northwest crane and placed into a hopper above the plant. The hopper has a split feed to two 2-x 8-ft. triple-deck Austin-Western vibrating screens for sizing. Throughs from the bottom deck are laundered over two settling boxes for sand recovery and then sent to waste.

An additional washing is made on the screens, by two 3½-in. perforated pipes to spray the gravel. Water is also sent into the discharge end of the hopper through two 2-in. pipes to provide agitation and a constant flow.

Since this plant is not located on a railroad spur, two DW10 Caterpillar tractor trucks with W10 wagons move the product from the plant bins to a siding about two miles distant. These wagons have a heaped capacity of 11 cu. yd., and with the tractor, have an overall length of 32 ft. 8 in.

Typical of the smaller operations in Louisiana is the Oden Gravel Co., at Woodworth. This plant was opened in September, 1945, and has just started full production. The area from which sand and gravel is obtained constitutes 188 acres, has about 4-to 10 ft. of overburden over a 105-ft. stratum of gravel. Gravel is reclaimed by an 8-in. Morris pump on a dredge equipped with a 53-ft. Eagle Swintek cutter. It is pumped to a single gravity screen with 1¼-in. square openings. Oversize drops directly into railroad cars, and throughs go into a sand box for reclaiming fines. Overflow is sent to waste. Stockpiles are built up by an American crane with a ⅞-cu. yd. bucket.

Track-Mounted Plant

Gifford-Hill and Co., Inc., plant at Minden, La., described in detail in the August, 1945, issue of ROCK PRODUCTS, page 80, is portable. Mounted on two flat cars, the flow of aggregates was shown in detail in a sketch. The deposit covers a large area but gravel stratum is thin, necessitating movement of the plant itself to cut down on the distance from the deposit. The deposit is recovered by walking draglines with perforated buckets for dewatering. An unusual amount of fine sand in the deposit allows some waste of fines by dewatering, and the sand produced has been found to meet rigid Federal specifications for concrete sand.

Sand separation is made by a trommel screen, and gravel sizing is made on a triple-deck horizontal vibrating screen. Sand and sized gravel

drops to surge bins, and bucket elevators move the product from the bins to railroad cars.

A unique feature of this portable plant is that the same pipes which form a support for the equipment also serve as water pipes for the wash water provided at the screens. The product is thoroughly washed with 1300 g.p.m. provided by an 8-in. pump.

The Gifford-Hill Co., Inc., plant at Turkey Creek, La., has recently added a new dredge and built another portable preliminary screening plant to augment the older plant, also portable, which is located at another deposit. Both of the portable plants provide gravel for the main screening plant, where final sizing is made.

At the new deposit, an 8-in. counterflow pump takes sand and gravel from a stratum from which the overburden has been stripped. The pump discharges over a 6-x 12-ft. gravity screen with ¼-in. square openings, oversize dropping into a 100-cu. yd. surge bin and throughs dropping into a sand box. Overflow is laundered to waste.

Overburden at the older deposit is also stripped, and the underlying stratum of sand and gravel is reclaimed by a 10-in. counterflow pump and sent to a similarly constructed portable plant for separation. Both plants are serviced by a 30-cu. yd. dump car, moving the product over standard gauge track to the main plant. This car was fabricated at the company-operated machine shop, and features automatic discharge to the hopper feeding the main plant.

The two dredge operations work 20 hours per day and the main plant only 10 hours, so that when the plant is not in operation, gravel is placed in a stockpile at the plant and reclaimed by a dragline.

Discharge from the hopper is to a belt conveyor, mounted on an A-frame which is in turn supported on a monorail for side movement. The conveyor can also be elevated from 15-to 35-deg., so that it can discharge to either the stockpile or to a hopper above a log washer. When the plant is in operation, discharge is to the hopper above the log washer, feed to the hopper being augmented by the dragline at the stockpile. Discharge from the log washer is to another belt conveyor moving the product to a series of trommel screens for sizing.

The product at this plant receives thorough washing, not only at the preliminary plants, but also in the log washer and at the trommel screens. Gravel stored in bins under the trommel screens can be blended to any specification on a blending belt under the bins. The belt discharges to a loading tipple for car loading.

Winford Sand and Gravel Co., Minden, operates a simple dredging plant with gravity screen for separation. The deposit is pumped directly to a 6-x 17-ft. gravity screen by an 8-in. pump, with no rehandling. One size of gravel and two of sand are made, and collected in boxes with truck loading gates. Capacity is about 20 cu. yd. per hour.

Monroe Sand and Gravel Co., Monroe, La., is building an entirely new all-steel plant to replace the older wooden one that has been in service for some years. The new plant will have greater flexibility and is expected to have a greater capacity than the old one.

The deposit, at some distance from the plant, is stripped with an electric dragline, and the same dragline loads gravel into 30-cu. yd. side-dump cars for movement to a sump near the plant. From the sump, where aggregate is washed by this rehandling, a 10-in. Amsco pump sends it to the screening plant.

Limestone

Although limestone is relatively unknown in Louisiana, occurring in only two sections as cap rock, it is quarried at Winnfield for flux stone.

The only cement plant in Louisiana is that of the Lone Star Cement Corp. at New Orleans. Limestone is imported from the St. Stephens or Chimney Rock limestone area in Alabama. Annual capacity is 1,600,000 bbl. of "Lone Star" and "Incor" cement.

Batching

(Continued from page 64)

dividual lockers. In one corner of the building is a storage room that contains a Kewanee boiler to provide heat for the showers and for the unit-heaters in the garage. A "parts room" is also included in this structure. The dispatcher's office, not constructed when the writer visited the plant, is a sound-proof office enclosed in the building which will also contain the boiler to provide steam to the aggregate bins and the water tank, as well as the pozzolith tanks. The warehouse and main office building, as well as the garage, were constructed of concrete masonry units. Stored in the warehouse are building materials of all kinds, with the exception of lumber and roofing materials. The warehouse also contains a boiler that provides heat for the office.

The owners of the Crown Concrete Co., have long been associated with the aggregate industry, operating the Coon Valley Gravel Co., as well as the Douds Quarries Co. On April 12, 1946, when the plant was formally placed in operation, an open-house party attracted over 300 contractors and engineers from all sections of the State.

Mr. Roupe, connected with the sand and gravel industry since 1934, is general manager of the Coon Valley Gravel Co., and is president and general manager of the Crown Concrete Co. F. D. Sprinkle is plant superintendent, and D. D. Jones is sales manager.

Flotation

(Continued from page 67)

atoms and C00H is a carboxyl group active in the filming of minerals since it ionizes in the following manner: $RC00^- + H^+$. Saturated straight chain fatty acids containing 6, 8 or 10 carbons are liquid at relatively low temperatures. Those containing 12 or more carbon atoms are solids, with the exception of the unsaturated 18 carbon group known as oleic acid, linoleic acid, and linolenic acid. This series is liquid by virtue of the fact that hydrogen is deficient within the molecule and thereby forms a group known as unsaturated fatty acids. These unsaturated fatty acids are readily dispersed and emulsified in water since they are liquids at normal water temperatures. The amount necessary in the average non-metallic froth flotation separation is about ½ to 2½ lbs. per ton.

Organic ammonias, known as amines or cationic flotation reagents, are by far the most versatile of all known reagents for non-metallic mineral separation. Development of the cationic reagents is relatively new. Within the past ten years more advance in ore dressing methods has been made by the use of these cationic reagents than during any previous period related to non-metallic flotation separations. The two reagents most widely used are derivatives of cocoanut oil and tallow. Coco amine reagents contain 8 carbon atom (actyl) amine, 10 carbon atom (decyl) amine, 12 carbon atom (dodecyl or lauryl) amine, 14 carbon atom (octyl) amine, 10 carbon atom and 16 carbon atom (hexadecyl or palmityl) amine which are all straight chain or aliphatic amines. Used as the relatively insoluble unneutralized amines or as the soluble amine salts, such as amine acetate or hydrochloride, these reagents are very easily dispersed and are very powerful collectors for acidic minerals or those having a high concentration of negatively charged surface ions.

Tallow amine reagents contain 16 carbon atom saturated (hexadecyl or palmityl) amine, 18 carbon atom saturated (octadecyl or stearyl) amine, 18 carbon single unsaturated (octadecenyl or oleyl) amine, and 18 carbon double unsaturated (octadecadienyl or linoleyl) amine. Tallow amines, as are all organic bases, are neutralized with acids such as acetic or hydrochloric. As the neutral salt, tallow amine becomes water soluble and easily dispersible in flotation pulps containing suspended mineral.

The general formula for free unneutralized amines is RNH_2. The formula for the ionizable neutral and water soluble salt, such as an amine acetate, is RNH_2Ac. R refers to the 8 to 18 carbon atom organic chain; the NH_2 refers to the ammonia group and the Ac is used to designate acetic acid. In water, RNH_2Ac ionizes to

Flotation

(Continued from page 99)

form $RNH_3^+ + Ac^-$. This, therefore, is the exact opposite way in which the organic acids act since the large part of the molecule has a positive charge on it. For this reason the cationic aliphatic amines are specific collectors for the acidic minerals such as silica, silicates such as mica, feldspar, syenites and other non-metallic minerals having a high concentration of negative surface charges. The versatility of these reagents is apparent. With such tools the modern ore dressing specialist has relatively unlimited ways of accomplishing results on complex non-metallic ores. He can float most any mineral he wishes under conditions which can be definitely controlled.

Economics of the Flotation Process

It is apparent, by refernce to Fig. 1, that the increase in dollar value of non-metallic minerals produced each year has been tremendous and that non-metallic mineral production is a very important economic factor.

Many non-metallic mineral concentrates are worth only $2.00 to $10.00 per ton. Relatively few approach the price of $30.00 to $37.00 per ton commanded by fluorspar. One can readily see that the total tonnage of industrial minerals produced each year is a very impressive figure.

Reagent costs vary considerably with the ratio of concentration. However, as an average, the cost of all reagents such as frothers, modifiers, depressants and collector will be between 12c and 25c per ton of concentrate produced. There are a few exceptions where the total reagent costs may approach $1.00 per ton of concentrate, but this is usually the case when several valuable mineral concentrates are separated from a complex ore.

Flotation mills which include grinding, classification, storage, separations by flotation and tabling methods and dewatering equipment cost approximately $400 per ton of concentrate per day. This figure is an average one for relatively high tonnage producers and is based on a 3:1 ratio of concentration. Any change in the ratio of concentration, any complications in producing an average grade concentrate or any market requirement which makes it necessary to produce a concentrate of exceptional purity will rapidly alter this figure. This is not a very large capital investment. The average life of equipment is such that ample return on the investment is assured.

A Few Commercial Separations

A few of the most successful commercial applications of froth flotation methods include: the separation of silica from phosphate, sylvite (KCl) from halite (NaCl), mica, foliated silicates and silica from cement rock, silica from barite, calcite and silica from fluorspar, foliated and granular silicates from ilmenite, mica and silica from feldspar, mica from clay and kaolinized minerals, silica from clays, and silica from iron bearing oxide or silicate minerals. There are many more interesting mineral separations which will be mentioned in detail in subsequent articles.

Possibilities Unlimited

There are several major developments which are at this time being pushed toward completion. The tonnages involved are somewhat staggering.

Iron ore is shipped from the iron range to the extent of 70,000,000 to 90,000,000 tons per year. High grade reserves have been so rapidly depleted that within the next decade we face a scarcity of ore concentrated by natural means. To supply the above tonnage of iron oxide concentrates by froth flotation methods alone is wishful thinking. However, even a part of the tonnage produced from an ore requiring a 3:1 ratio of concentration would make this development one of major proportions.

All low grade ores and, in particular, the pegmatites will be utilized at a profit. With low cost methods of concentration very few mining properties should be abandoned without first considering all minerals in the ore.

Fine grained granite and coarse grained granite quarry fines should offer a very fertile field for investigation.

Recovery of the black minerals or rarer minerals from beach sands is now a major operation. Many deposits passed by heretofore are being re-examined for valuable mineral content.

Structural materials, such as gypsum, may be subjected to flotation treatment as high grade deposits are depleted or market requirements become more exacting.

The rubber industry, the wheat milling industry and the ceramic industry are applying froth flotation methods to their problems. Better products or new products are always the driving forces behind all progress.

Washington News

(Continued from page 47)

line, and Milton, all in Massachusetts. This order, which provides for an increase of 11.5 percent in all specifications, is effective until November 15, 1946. The increase in prices may be rounded off to the nearest 5 cents.

Detroit Gravel Prices

An increase of 5 cents per cubic yard has been granted to producers supplying the Detroit area. These producer areas are designated the Utica-Rochester area and the Northville area. Maximum prices for re-

sellers are to be "his maximum net price to each class of purchaser in effect just prior to the issuance of this order, plus the actual dollars-and-cents increase in his net invoiced cost due to the adjustment granted by this order to producers." The tables below give the recently announced OPA prices:

EAST SIDE OR UTICA—ROCHESTER PITS

Specifications	F.o.b. pits Per cu. yd.	Delivered into greater Detroit area Per cu.yd.
Gravel 60/40	$1.10	$2.05
Sand	.90	1.85
Clear pebbles	1.55	2.50

WEST SIDE OR NORTHVILLE PITS

Specifications	F.o.b. pits Per cu. yd.	Delivered into greater Detroit area Per cu.yd.
Gravel 60/40	$1.20	$2.15
Sand	1.00	1.95
Clear pebbles	1.70	2.65

Cement Production

BUREAU OF MINES reports that production of finished cement during March, 1946, totaled 11,299,000 bbl. or 77 percent greater than that reported for March, 1945. Shipments of 12,698,000 bbl. were 82 percent greater than those reported for the corresponding month of 1945. Mill stocks on March 31, 1946, were 7 percent lower than at the end of February, 1946, and 14 percent lower than a year ago. Demand for cement, as indicated by mill shipments, was higher than in March, 1945, in all districts. In about one half of the districts, shipments were more than double those of March, 1945.

The following statement gives the relation of production to capacity, and is compared with the estimated capacity at the close of March, 1946, and of March, 1945.

RATIO (PER CENT) OF PRODUCTION TO CAPACITY

	Mar. 1946	Mar. 1945	Feb. 1946	Jan. 1946	Dec. 1945
The month	55.0	31.0	50.0	47.0	48.0
12 months	48.0	38.0	46.0	44.0	43.0

Reopen Quarry

JOE OLDHAM, excavation and materials contractor, who has been engaged in construction of the $40,000,000 Kingsley dam on the Big Platte river, will reopen the Atwood quarry near Liberty, Mo. The quarry was formerly operated by C. P. Atwood. Additional equipment will permit a production of 500 tons of crushed rock daily.

Pavement Yardage

AWARDS of concrete pavement for May and the first five months of 1946 have been announced by the Portland Cement Association as follows:

SQUARE YARDS AWARDED

	May 1946	First 5 Mos., 1946
Roads	3,355,302	10,497,398
Streets and Alleys	1,698,143	4,088,451
Airports	98,805	836,081
Total	5,152,250	15,421,930

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Mr. Schindler, standing beside two New Leader Spreaders which he has been operating for nearly four years.

IT'S THE NEW LEADER SPREADER," says C. T. SCHINDLER,

limestone contractor of Linn County, Iowa.

"They really do the job."

Latest model New Leader Spreader equipped with twin distributor discs. Note the extremely wide bottom and steep sloping sides. This unit may be furnished with Rock Bottom Slides which permit unloading rock without running spreader mechanism.

ALL WEATHER ADAPTABILITY KEEPS THE *NEW LEADER* BUSY MOST OF THE TIME

Summer or winter, rain or shine, the New Leader Spreader is a versatile profit-maker. When you're not spreading aglime or marl, and you have your spreader equipped with a rock bottom attachment, you can use this unit for hauling sand, gravel, chips, and small rock for farm driveways, construction jobs, etc. Material won't freeze to sides of hopper during cold weather because hopper is made of wood. Extremely wide bottom and steep sloping sides assure steady and accurate flow of material to distributor discs even when material is wet. Designed to give years of dependable service, the latest model New Leader has an electrically welded all steel frame which mounts on any truck chassis. Hoppers are made of 1 in. flooring securely bolted to steel ribs. Ends are made of selected lumber. Entire mechanism is driven through power take-off from truck transmission. Units are available in standard sizes of 9, 11, 13 and 15 foot hopper lengths.

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INFORMATION

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TO HELP YOU MEET TODAY'S PROBLEMS AND TO MAKE PLANS FOR TOMORROW

1 BAGS—Bemis Bro. Bag Co. has published a new booklet on the care of paper bags, entitled "Important Facts for the Man in Charge of Paper Bag Storage," which contains interesting data on proper methods to follow in caring for paper bags in storage and how to restore moisture to paper bags after they have dried out.

2 BELTS—B. F. Goodrich Co. has issued Catalog Section 2100 describing and illustrating Highflex square edge transmission belts. Also given are details of the manufacturing and testing program of the belt, descriptions of other types, with tables listing stock sizes.

3 BUCKETS — Chicago Steel Foundry Co. has issued a bulletin describing and illustrating the advantages of Evansteel in making conveyor buckets, drag chains, pulverizer hammers, conveyor screws, etc. Also included are tensile test and heat reports.

4 BUCKETS — The Hayward Co. has issued Bulletin 675 describing and illustrating Class E-15 grab buckets for handling coal and coke. Chart of bucket load capacities, weights and dimensions is also given.

5 CLUTCH—Salsbury Motors, Inc., Bulletin No. 4501 describes and illustrates Models 300 and 600 automatic clutch designed for operating loads up to 3 hp. and 6 hp., respectively. Construction features and dimensional data of both models are also given.

6 CONCRETE SEALER—Sika Chemical Corp. has released Bulletin QS-45 describing and illustrating how to seal leaks against pressure with No. 2, 4, and 4A Sika concrete sealer without removing water pressure. Detailed instructions for leaking surfaces and joints are also given.

7 CONVEYORS—Robins Conveyors, Inc., Bulletin No. 127 describes and illustrates mine conveyors in sizes for 24-, 26-, 28-, 30- and 36-in. belts, or wider, for carrying bulk materials. Detailed facts about the head end, takeup, controls and drives, pulley outfits, deck section, loading plates, tail section, idlers, etc., are also given.

8 CRANES — Harnischfeger Corp. new 28-page book describes and illustrates grab bucket cranes. Construction details are given and various industrial applications are illustrated.

9 CRANES—Orton Crane & Shovel Co. announces a 16-page catalog, No. 77, describing and illustrating standard and broad gauge Diesel and gasoline locomotive cranes. Construction and engineering details, charts giving clearance dimensions, weights and lifting capacities are also included.

10 CRUSHERS—Allis-Chalmers Mfg. Co. has released Bulletin 7B6006C, describing and illustrating Type R reduction crusher, also Bulletin 7B6369, describing and illustrating the new A-1 jaw crusher which is recommended for tough abrasive, high compressive strength materials. Capacities in tons per hour and principal dimensions are tabulated for the four sizes of each machine.

11 CRUSHERS — McLanahan and Stone Corp. has released a new bulletin, Catalog BD-457, describing and illustrating Black Diamond single roll crushers for lime, phosphate rock, gypsum, shells, fire clay, rock and similar materials. The bulletin also contains cross-section diagrams and brief descriptions of stationary or semi-portable coal crushing tipples and the "Rockmaster" crusher for coal, mine rock, refuse and rock of any size.

12 DIPPER TEETH — Daniels-Murtaugh Co. new bulletin, No. 115, describes and illustrates various types of teeth for dippers and dragline buckets including complete specifications.

13 DREDGING LADDER — Eagle Iron Works has issued a 24-page Catalog No. 745 describing and illustrating the "Swintek" dredging ladder for sand and gravel dredging. Installation views, performance data, and descriptions of the light and heavy duty types are also given.

14 DRILLS — The Sanderson-Cyclone Drill Co. has released Catalog B, describing and illustrating No. 1000 series air-speed spudder large blast hole drills. Complete assembly diagram, typical installations, and tool equipments are also shown.

15 DRIVES — The American Pulley Co. has released a new catalog on fractional-horsepower drives which also contains complete price lists and specifications on F.H.P. sheaves and belts, together with condensed and simplified drive tables for a wide range of center distances and drive ratios.

16 DRIVES — Electric Machinery Mfg. Co. has released a new 16-page booklet, No. 183, describing and illustrating the E-M magnetic adjustable-speed drive for boiler draft fans, centrifugal pumps, centrifugal blowers and compressors. Principles of operation, performance characteristics, and applications are also included.

17 DUMP TRUCKS — The Euclid Road Machinery Co. has published two new catalog folders on rear-dump and bottom-dump trucks. Form No. 101 features Model F 15-ton rear-dump truck for off-the-highway hauling of earth, rock, ore, etc., with a capacity of 9.7 cu. yd. and top speed loaded of 22 m.p.h. Form No. 201 describes and illustrates the 13-cu. yd. bottom-dump truck designed for a payload capacity of 40,000 lb. and maximum speed loaded of 26 m.p.h. Specifications and technical information are also included.

18 DUST COLLECTORS—The W. W. Sly Mfg. Co. Bulletin No. 100 describes and illustrates four types of dust collectors for capacities from 1400 up to 6000 cu. ft. of air.

19 ELECTRONICS — Allis-Chalmers Mfg. Co. has published a 20-page book, No. E-6358, entitled, "Introduction to Electronics," prepared by Dr. Walther Richter. The fundamentals of conversion and control of electric power in a load, methods of controlling electric power, differences between a vacuum tube and the equivalent mechanical device, methods of specifying tube performance, application of tube characteristics for design purposes, and use of the high speed response of the tube are some of the subjects discussed in this interesting bulletin. Line drawings, curves, and sketches are also included.

20 EXCAVATORS — Koehring Co. has published Catalog 605 describing and illustrating the new 605 excavator equipped with the 1½ cu. yd. shovel and 30-ton crane and quickly convertible to dragline, crane or pull shovel. Details of shovel, dragline and crane attachments are also given.

21 FIRE BRICK — Harbison-Walker Refractories Co. has released a 13-page booklet, describing and illustrating in-

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sulating fire brick for use in furnace construction. Typical applications are shown, also a table of theoretical heat losses and heat storage capacities.

22 NOZZLE TESTER—The Buda Co. has issued a new 4-page bulletin, No. 1238, describing and illustrating the Universal Diesel nozzle tester that tests all makes and models of Diesel nozzles and injectors on the job. It is supplied with gauges of either 3000 or 5000 p.s.i. capacity and is equipped with metal carrying case provided with slides and drawers for quick, compact storage of tester and accessories.

23 PULVERIZERS—Raymond Pulverizer Division of Combustion Engineering Co., Inc., has issued Bulletin No. 57 describing and illustrating vertical mills for extreme fine grinding of medium soft non-metallics, chemicals and similar materials. Cross-section drawings and flowsheet showing layout of mill with feeder, cyclone collector and piping are also shown.

24 PUMPS — Ingersoll-Rand Co. announces a new 20-page two-color bulletin, No. 7057, covering the design, construction and engineering details of the Cameron single-stage general service pumps, designed for capacities to 25,000 g.p.m. against heads up to 300 ft. Typical installations, cross-section and interior views, performance and dimension tabulations are also given.

25 PUMPS—The LaBour Co., Inc., Bulletin No. 51 describes and illustrates the Type G centrifugal pump. Construction features, advantages, operating information and instructions for installation and care of the pump are also given. A large layout plan of the pump and table giving friction of water in the pipes is included.

26 PUMPS—Oliver United Filters, Inc., has issued Bulletin No. 309 describing and illustrating diaphragm slurry pumps designed to operate with pressures up to 100 lb.

27 PYROMETERS — Cambridge Instrument Co., Inc., has issued a new 12-page Bulletin 194-SA describing and illustrating surface pyrometers—roll, extension, mold and needle models, for use in plant and laboratory.

28 RECORDERS—Leeds & Northrup Co. has published Catalog N-00-664(1), entitled "Rotary Kiln Operation," describing and illustrating complete line of instruments for measuring or controlling various kiln temperatures for efficient operation of rotary kilns for the production of high-quality lime, cement or mineral ores. Included in the booklet is a two-page schematic diagram of a typical kiln showing various points to which instrumentation is being applied. Numerous pictures of equipment in actual operation are also shown.

29 SAFETY EQUIPMENT — Mine Safety Appliances Co. has published a 178-page 6-B Catalog, describing and illustrating safety equipment for industrial application. Also available is a miniature edition of this catalog containing the same material.

30 SCALES—Scientific Concrete Service Corp. has issued a bulletin describing and illustrating Toledo scales used with $(SC)^2$ control for accurate batching of concrete to a tolerance of plus or minus ¼ percent with allowance for water variation. Typical arrangement of aggregate-water scale and cement scale with recorder is also shown.

31 SCREENS—Screen Equipment Co. has released a 28-page booklet entitled "A Guide to Better Screening" describing and illustrating various types of vibrating screens for crushed stone, sand and gravel, limestone, foundry sand, etc. Typical installations, assembly diagrams, table of capacities, and instructions for installation and care of screen are also included.

32 SETTLERS—Claude B. Schneible Co. has issued Bulletin No. 1144, describing and illustrating settling and dewatering equipment designed for use in disposal of sludge from wet method dust collectors, sand washing systems, slag, slurry, silt, chemical and industrial wastes. Tanks of various types and capacities are shown in the bulletin.

33 SHOVELS—Bucyrus-Erie Co. new 24-page bulletin describes and illustrates the dozer-shovel for International Trac-TracTors. Large photographs and pen drawings graphically depict actual operating conditions on a variety of digging, earthmoving and material-handling jobs.

34 STARTERS—General Electric Co. has released Bulletin GEA-4368, describing and illustrating a-c magnetic reversing starters for full-voltage starting of squirrel-cage induction motors. Information on where to use these starters, construction features, wiring and dimension diagram are also shown.

35 TRACTORS—Caterpillar Tractor Co. 32-page color catalog, Form 9106, describes and illustrates the Diesel D6 tractor. Specifications, action views, design features, also complete line of matched equipment for the D6 tractor are shown.

36 WELDING—C. E. Phillips & Co. has issued an 8-page booklet describing and illustrating four ways to salvage, reclaim and conserve iron castings by electric arc welding. Included in the booklet are pertinent facts and engineering data for foundries and machine shops on the use of Phillips "600," Nico, Copper-Arc and Arcast electrodes for welding cast iron.

37 WELDING—Welded Steel Shapes, Inc., has released a new brochure for executives and engineers, describing and illustrating the advantages of structural steel welding. Practical applications of specialized service are also shown.

38 WIRE ROPE—R. G. LeTourneau, Inc., has released a new Tournarope wall chart, Form No. N-104, measuring 17- x 22-in., which gives cable requirements for all LeTourneau equipment and has been prepared especially for operators and maintenance men. Practical tips on how to get longer service from wire rope are also given.

39 WIRE ROPE—Preformed Wire Rope Information Bureau has released a 36-page book describing and illustrating the important role wire rope has played in the war. Interesting photographs portray the many ways in which the Army and Navy used wire rope in the operation of ships, military vehicles, machines and devices.

40 X-RAY EQUIPMENT—North American Philips Co., Inc., has announced a new 8-page condensed catalog called "Norelco Electronic Products" describing and illustrating film-type x-ray diffraction equipment and the new Geiger-Counter x-ray spectrometer.

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Gypsum Mining

(Continued from page 70)

breaker labor and delay time can be eliminated.

Undercutting

The regular 50-hp. coal undercutting machine requires several changes when used in gypsum rock. In coal, the cutting speed across the face varies from 1¼ in. to 36 in. per minute with cutter bars up to 10-ft. length, and nine bit positions vertically, cutting a 6-in. slice or kerf. In gypsum the lateral speed is reduced to 6 in. per minute across the face with an 8½-ft. cutter bar and as many as 15 bit positions to cut a 6-in. kerf. Gypsum undercutters also require a solvent cutting oil to prevent the cuttings from clogging up the bits and cutting chain with resulting machine overload.

The economical feasibility of undercutting gypsum is a wide open field for debate. Under certain conditions an undercutter is economical in reducing blasting costs and increasing tonnage per working place to the advantage of machine loading; in other instances an undercutter serves no useful purpose.

The following are examples of some undercutter usages in gypsum:

WESTERN NEW YORK—Undercutting is done in a 48-in. height gypsum seam with rolling bottom, extensive timbering and 25 ft. working face. Original floor level undercutting proved impracticable because of the rolling, hard limestone bottom. Cutter was then put on 10-in. high platform and a 15-ft. cut made above the bottom with 5 ft. of solid gypsum left on each rib. Although this method reduced the number of drill holes required and lowered the explosives cost, the combined difficulties of lost time moving from room to room and expensive bottom clean-up resulted in discontinuing undercutting. One low-seam operator has considered the possibilities of using a center vertical cutter but no action has been taken.

IOWA—Undercutting 10 ft. height gypsum, 20 ft. wide room, 8 ft. depth with 2-man undercutter crew and 2-man drill and blast crew was instituted in place of shooting off the solid face. The 4-man crew could undercut, drill and blast three rooms per shift for 350 tons production costing 16c per ton, including explosives, with a net saving of 8c per ton split equally between labor and explosives. These savings were made as compared to former standard mining conditions. Thinning out of the gypsum seam, poor roof and mud slips finally necessitated changing to quarry operations.

KANSAS—This undercutter was the first installed in gypsum in the United States and has been operated for a number of years. The room faces are 40 ft. wide and 10 ft. high

and are undercut 8 ft., producing more than 200 tons per blasting round. No comparative costs are available on this operation.

MICHIGAN — An undercutter was tried out in a 9 ft. high gypsum bench to provide a smooth floor for shuttle car operations and lessen the possibility of shooting into the water carrying rock strata below the gypsum. The presence of hard dolomite streaks thruout the gypsum burned out hard tipped cutter bits and the cost of carboloy bits exceeded 25c per ton which proved too costly for economical operation.

TEXAS—Narrow development headings 16 ft. wide and 10 ft. high were the initial working faces in instituting undercutting with a 9-ft. length cutter bar. No particular difficulties were encountered in the cutting operation, but the narrow working places producing 100 tons per cut as compared to over 240 tons per cut in regular 30-ft. width, 14-ft. height roomwork, along with leveling out the inherent difficulties of a new operating method, have held up comparative cost figures.

Undercutter Possibilities

Undercutter results appear to be most favorable when the gypsum seam is not too solid and blocky and will fracture easily with a minimum of explosives, conforming with the original development of undercutting in coal.

Successful undercutting offers the following possibilities:

1. Lower cost per ton drilling and blasting.

2. More tonnage per working face, cutting down moving delay losses for machine loading operations.

3. Lighter explosives charge is less damaging to weak roof and may allow a substantial seam recovery increase with wider working face.

4. Smoother floor for loading machines, shuttle cars and mine track.

However, the possibilities of economical undercutting require detailed consideration of the specific problems offered by the mine in view; present costs; production required; presence and hardness of impurities in the seam; rock breakage characteristics; loading machine utilization; and general mine layout and clearances.

(To be continued)

Erratum

IN the April, 1946 issue of ROCK PRODUCTS an article appeared on the subject, "Spectrophotometric Determination of Titania in Portland Cement." The author of this article has called our attention to two slight errors. On page 104, in line 12 of the second column, "optical" procedure should read "optional" procedure. In Table 1 on the same page, the heading "a.d. the from mean" should read "a.d. from the mean."

Chemist Corner

(Continued from page 73)

of the Vinsol resin alone, ranged from 5.46 to 5.76 percent with an average of 5.58 percent (Table 5). The amounts of sulfur used were greatly in excess of those which might be extracted from a cement, and the resulting loss in methoxyl is slight.

If the methoxyl method is being relied upon solely, in determining Vinsol resin in cement, more nearly theoretical results would be obtained by omitting stannous chloride from the extraction procedure.

8. Effect of Sodium Hydroxide.

Vinsol resin is sometimes added to cement in the form of the sodium resinate solution, either at the mill or in the mixing water.[10] Some ethers are known to be susceptible to hydrolysis by alkalies.[11] There is a question, therefore, about the advisability of using the methoxyl method on a cement to which the resin has been added as the resinate.

Six samples, 20- to 40-mg. of Vinsol resin, were weighed into 100-ml. beakers, dissolved in 15 ml. of 1.5 percent sodium hydroxide solution, and allowed to digest on the steam bath for periods of 18 to 46 hours.

They were then transferred to 1-liter beakers and the extraction and methoxyl determinations made. In the course of digestion with the alkali, however, almost half of each sample was converted into a mass insoluble in chloroform and alkali, so the methoxyl values were based on the weights of soluble material dried at 100 deg. C. rather than on the weight of original material. The amount of the sample thus made unavailable was increased by increased time of digestion. The values ranged from 4.84 to 3.99 percent (Table 6) and indicate that contact with alkali lowers methoxyl content. These determinations represent an extreme case, since the amount of alkali used was far in excess of the theoretical amount required to saponify the Vinsol resin.

9. Blank Determinations.

For each experiment a blank determination was made, using the same reagents and going through the same procedure as in the determination. A series of blanks on the A.S.T.M. chloroform-extraction method gave values for residue which averaged 0.0011 g., based on weighings

TABLE 5—EFFECT OF SULFUR ON THE DETERMINATION OF METHOXYL CONTENT

Sample Wt. Vinsol Resin, Gram	Wt. S Added, Gram	Wt. S / Wt. V.r.	CH_3O Based on Wt. V.r., Percent
0.0263	0.0145	0.55	5.52
.0232	.0090	.39	5.51
.0200	.0042	.21	5.76
.0281	.0013	.046	5.63
.0284	.0011	.039	5.46
		Average	5.58

TABLE 6: EFFECT OF TIME OF DIGESTING VINSOL RESIN WITH 15 ml. OF 1.5% SODIUM HYDROXIDE SOLUTION, FOLLOWED BY ACIDIFICATION AND CHLOROFORM EXTRACTION

Sample Wt., Gram	Time of Digestion, Hours	Wt. After Drying Extract at 100° C, Gram	CH_2O Based on Wt. After Drying at 100° C, Percent
0.0367	18	0.0210	4.84
.0260	22	.0141	4.51
.0331	24	.0185	4.31
.0221	46	.0110	3.99
			Average 4.41

at 60 deg. C., and the subsequent methoxyl blanks averaged 0.084 ml. of 0.1 N sodium thiosulfate. Whenever a fresh supply of reagents were used, new blanks were determined.

Summary and Conclusions

An investigation was made of the factors which may cause variable results in the determination of Vinsol resin in cement by the extraction method[1] and the methoxyl method.[2]

1. Heating the chloroform-soluble extract at 57 to 63 deg. C. did not remove all of the chloroform, giving weights about 15 percent too high. Heating the extract at 100 deg. C. for 15 min. removed the chloroform without changing the methoxyl content of the resin.

2. The average methoxyl content of the Vinsol resin used in this investigation was found to be 5.7 percent, as claimed by the manufacturer.

3. Chloroform extraction using HCl and $SnCl_2$ as in Sec. 27 (C114-44) of the A.S.T.M. Standards 1944, was found to lower the methoxyl content of Vinsol resin about 9 percent if conditions were carefully controlled. Longer time of contact increased the loss of methoxyl. About half as much methoxyl was lost if $SnCl_2$ was omitted. The presence of sulfur lowered the methoxyl content only slightly.

4. Digestion with NaOH solution was found to render part of Vinsol resin insoluble in both chloroform and NaOH, and to lower the methoxyl content of the soluble portion.

For qualitative identification of Vinsol resin in a cement, the methoxyl method is doubtless of value. Its use in distinguishing between Vinsol resin and mineral oil in a chloroform-soluble extract may be an aid. Because so many factors, which are difficult to control, cause loss of methoxyl, use of the method as a quantitative measure of Vinsol resin in cement is questioned.

References

[1] Section 27 (C114-44), A.S.T.M. Standards, 1944, Part II, p. 27.

[2] For a discussion of the principle and historical development of method, see 1944 compilation of "A.S.T.M. Standards on Cement," p. 156.

[3] Section 11 (C114-44T), Tentative

(Continued on page 110)

Methods of Chemical Analysis of Portland Cement, 1944 A.S.T.M. Standards, Part II, p. 1223.

[4] The Testing of Portland Cements Containing Interground Vinsol Resin, by Raymond L. Blaine, Jason C. Yates, and John R. Dwyer. Proceedings of A.S.T.M. for 1945.

[5] Effect of Heat on Portland Cements Containing Vinsol Resin, by Bean and Litvin, in A.S.T.M. Bulletin, August, 1945, p. 30.

[6] Scott's Standard Methods of Chemical Analysis, N. H. Furman, Editor; Vol. Two, 5th Ed., p. 2528.

[7] This information is contained in a report dated June 8, 1943, of the Working Committee on Methods of Chemical Analysis of Committee C-1 on Cement, of the A.S.T.M.

[8] Beitraege zur Erforschung der Angosturaalkaloide. Ueber Isomerisierung und Abbau des Kusparins, Troeger und Müller, Archiv der Pharmazie, 252, 459 (1914).

[9] A.S.T.M. Bulletin, Dec., 1941, p. 31.

[10] The Reaction of Vinsol Resin as It Affects the Air Entrainment of Portland Cement Concrete, by Charles E. Wuerpel and Albert Weiner, A.S.T.M. Bulletin, Oct., 1944, No. 130. See also: Tests of Concretes Containing Air-Entraining Portland Cements or Air-Entraining Materials Added to Batch at Mixer, by H. F. Gonnerman, Journal of the American Concrete Institute, June, 1944, Vol. 15, No. 6; Proceedings, Vol. 40, p. 477-507.

[11] Reactions of Organic Compounds, by W. J. Hickinbottom, p. 112.

Acknowledgments: The analyses reported in Table 1 were made by Cyril Crocker, Milton Pollock and Jeannette Williamson. Micro-balance weighings were made by Kenneth D. Fleischer.

Theory and Practice of Lime Manufacture

EXTREMELY little up-to-date literature on the subject of lime manufacture is available today. The new 423-page book, "Theory and Practice of Lime Manufacture," by Victor J. Azbe, therefore supplies an urgent demand for practical information for lime plant officials and key employes.

It consists largely of a compilation of articles which have appeared in ROCK PRODUCTS, going back as far as 1923 and up to and including 1946, and also papers which have been presented by Mr. Azbe before the National Lime Association, The American Chemical Society, The American Society for Testing Materials, The Canadian Institute of Mining & Metallurgy, and The American Institute of Mining & Metallurgy.

Contained within the more than 400 pages are many drawings, graphs, and photographic illustrations, and tabulations of inestimable value to the lime plant operator seeking greater plant efficiency under the varying conditions of his operation. Both rotary and shaft kiln lime plant operation is discussed in detail. There also is a chapter on rock wool manufacture.

To readers of ROCK PRODUCTS, particularly in the lime industry, Mr. Azbe needs no introduction. His frequent addresses before national conventions of the industry and before many engineering societies has made him widely known throughout this country, Canada, Europe, and South

America as an authority on lime manufacture.

His book in a green, substantial binding, may be obtained for $8.00 a copy by addressing Y. N. Rauert, 6625 Delmar Blvd., St. Louis, 5, Mo.

FINANCIAL

RECENT DIVIDENDS

Lone Star Cement Corp...	$0.87½	June 28
Pacific Coast Aggregates...	.05	June 20
Ideal Cement Co.....	.25	June 30
Lehigh Portland Cem. Co.	.37½	Aug. 1
Bessemer Limestone & Cement Co., pfd.....	.75	July 1
Penn. Glass Sand. Corp...	.25	July 1
Penn. Glass Sand Corp., pfd.	1.25	July 1
Canada Crushed Stone, Ltd.	.10	June 20
Basic Refractories	.10	June 15

CALAVERAS CEMENT CO., San Francisco, Calif., reports net income of $9075 for the year ended December 31, 1945, after taxes, depreciation, and accelerated depreciation of emergency facilities, compared with $10,251 in 1944. Net sales for 1945 were $1,677,705 as against $1,494647 for 1944.

•

WOLVERINE PORTLAND CEMENT CO., Kalamazoo, Mich., had a net loss of $117,175 for the year ended December 31, 1945, which compares with a loss of $71,119 for 1944.

•

PENNSYLVANIA GLASS SAND CORPORATION, Lewistown, Penn., reported the following consolidated income account for the years ended December 31:

	1945	1944
Net sales	$5,308,026	$5,479,895
Costs and expenses.	3,541,583	3,439,263
Depreciation, dep. & amortization	349,265	290,254
Operating profit ...	1,417,179	1,750,379
Other income	78,908	73,533
Total income	1,496,087	1,823,912
Bond interest	104,212	115,918
Bond discount, etc.	31,394	23,589
Federal income tax.	415,761	306,356
State income tax...	30,440	37,991
Excess profits tax..	291,063	769,351
Net income	623,218	570,706
5% pfd. dividends..	155,000	155,000
Common dividends.	321,860	321,860
Surplus for year....	146,358	93,846
Earned surplus, 1-1	1,227,844	1,133,998
Earner surpl., 12-31	1,374,202	1,227,844

•

SCHUMACHER WALL BOARD CORPORATION, Los Angeles, Calif., had a net profit of $103,663 for the eight months ended December 31, 1945. This compares with $138,035 for the year to April 30, 1945. Net sales for the eight months ended December 31, 1945, were $1,164,035 as compared to $138,035 for the year to April 30, 1945.

•

INTERNATIONAL MINERALS & CHEMICALS CORPORATION, Chicago, Ill., is planning to sell 145,834 shares of unissued common stock, 131,769 shares of which will be offered under subscription rights to common stockholders and 9321 shares in conjunction with 4679 treasury shares offered

for purchase by employes. Subscription rights would be offered to stockholders on the basis of one share for each five shares held. Proceeds will be used, together with other funds, for construction and equipment of an amino products chemical plant at San Jose, Calif., to cost $2,250,000, and for development of a phosphate mine, and construction and equipment of a mill and flotation plant at Bartow, Fla., to cost about $2,680,000.

•

LONE STAR CEMENT CORPORATION, New York, N. Y., reported the following consolidated income account for the years ended December 31:

	1945	1944
Sales	$31,092,952	$27,966,013
Mfg., etc., expense	21,150,778	18,883,894
Selling, etc., expense	3,074,773	2,785,833
Depreciation and depletion	1,824,844	1,904,374
General taxes	739,858	838,987
Operating profit	4,302,699	3,552,925
Other income	536,404	426,575
Total income	4,839,103	3,979,500
Misc. charges	390,204	479,146
Income taxes	1,663,988	1,427,297
Foreign exch. adj.	10,773	17,801
Net income	2,774,138	2,055,256
Com. dividends	2,134,343	1,660,045
Surplus for year	639,795	395,211
Earn. surp., 1-1	12,198,348	11,546,210
†Inc. tax adjust.	cr 148,000	cr 285,000
Foreign exch. adj.	cr 26,382	cr 3,571
*Debits	42,668	31,644
Earn. surp. 12-31	12,969,857	12,198,348

*Amount transferred to statutory surplus of subsidiaries in Argentina and Brazil.

†Estimated net effect of carry-back of unused excess profits tax.

President R. A. Hummel reported 1945 net income at a three-year high. Exports accounted for a substantial part of the company's plants in this country. In Cuba, demand for cement has exceeded production capacity, necessitating substantial imports from the United States. A fourth kiln has been installed in the Cuban plant to meet this demand.

•

BOSTON SAND & GRAVEL CO., Boston, Mass., showed a net loss of $51,319 for the year ended December 31, 1945, as compared with a small net profit of $181 for the year ended December 31, 1944.

•

BLUE DIAMOND CORPORATION, Los Angeles, Calif., had a net income of $236,454 for the year ended December 31, 1945, which compares with $214,245 for the calendar year 1944. Net sales in 1945 were $5,524,901 as against $4,940,973 in 1944.

•

AMERICAN SILICA SAND CO., Ottawa, Ill., made an interest payment of 1½ percent on March 1, on income 6's, due 1951, to holders of record February 18, 1946.

•

NEW ENGLAND LIME CO., Adams, Mass., reported a net income of $38,345 for the year ended December 31, 1945, as compared with $16,611 in 1944. Net sales in 1945 were $677,979 as against $491,754 in 1944.

Manufacturers' News

Chester Mfg. Co., Lisbon, Ohio, manufacturers of chain hoists, trolleys, etc., formerly operated as a partnership, has been incorporated as the Chester Hoist Co. Officers of the company are: Hal F. Wright (founder of the business), president; Mary T. Wright, vice-president; and Harry E. Hill, secretary and treasurer.

LaPlant-Choate Mfg. Co., Inc., Cedar Rapids, Iowa, has established a factory branch in Oakland, Calif., replacing the former services at San Leandro, Calif.

Roy Darden Industries, Atlanta, Ga., has announced the election of James S. Sigler as vice-president and secretary of Roy Darden Industries, Southwestern Division, Inc., with headquarters at Dallas, Texas. Mr. Sigler is well known in both the construction and concrete block industries throughout the Southeastern States. For the past six years he has been engaged in the distribution of concrete block plant equipment for an Alabama concern. In charge of field operations, he was responsible for the promotion and installation of many of the better concrete block plants in several of the Southwestern States. Mr. Sigler in his new capacity will have charge of field and installation operations in a wider field of activity, including foreign country distribution.

James S. Sigler

Fairbanks, Morse & Co., Chicago, Ill., has announced the election of L. W. Stolte as secretary, to replace Fred C. Dierks, who has retired after 45 years of service.

Thermoid Co., Rubber Division, Trenton, N. J., announces the appointment of Edward C. Hoeflich as industrial sales promotion manager. Mr. Hoeflich was formerly connected with Ace Manufacturing Co., Philadelphia, Penn., as sales and advertising manager, and Henry Disston & Sons of Philadelphia as manager of steel specialties division. Prior to these connections, Hr. Hoeflich was associated with the Industrial Advertising Agency field for 17 years, operating his own agency in Philadelphia and Camden, N. J.

Edward C. Hoeflich

International Harvester Co., Chicago, Ill., has announced the following changes in administrative personnel: Judson F. Stone has resigned as chairman of the board of directors but will continue to serve as a director and as a member of the executive committee; Fowler McCormick, formerly president, has been elected chairman of the board and chief executive officer of the company; Sydney G. McAllister, formerly chairman of the executive committee, which position has now been discontinued, will continue to serve as a director and as a member of the executive committee; John L. McCaffrey, formerly first vice-president, has been elected president to succeed Mr. McCormick; offices of first vice-president and second vice-president have been eliminated; W. E. Worth and P. V. Moulder have been elected executive vice-presidents; and W. C. Schumacher has been appointed to succeed Mr. Moulder as head of the motor truck division.

Robins Conveyors, Inc., Chicago, Ill., announces the retirement of C. C. Brooks, who was Western manager of the hoisting machinery division, Chicago, Ill.

Pittsburgh Corning Corp., Pittsburgh, Penn., announces plans for building two plants at Sedalia, Mo., for the production of glass block and Foamglas, at an estimated cost of $2,000,000.

R. G. LeTourneau, Inc., Peoria, Ill., has announced the appointment of Stanley D. Means as domestic sales manager in charge of all sales in the United States, Canada, Hawaii, and Alaska. His duties will include management of the Eastern Central, and Western sales territories, and governmental sales, as well as personal supervision of industrial sales. Mr. Means has been affiliated with the sales department for the past ten years. First appointed as field engineer, he has served as district representative, training manager, federal sales representative, and government sales manager. He was appointed manager of the Washington, D. C. office in 1942 and returned to Peoria three years later as industrial sales manager.

Stanley D. Means

Iron & Steel Products, Inc., Chicago, Ill., has appointed Charles A. Marshall as general manager.

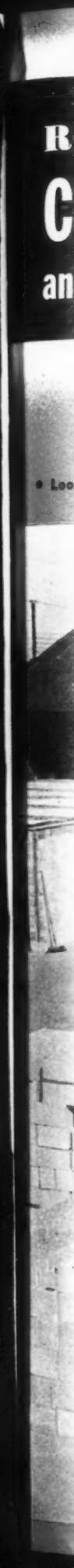
The Goodyear Tire & Rubber Co., Akron, Ohio, has announced the appointment of E. T. Rainey as manager of manufacturers sales for the Western division with headquarters at Los Angeles, Calif. He was formerly district manager of the Aviation Products Division in Seattle, Wash. Mr. Rainey will be assisted by R. E. Bolton, in the off-the-road farm implement and agricultural machinery fields in that area, while William van Amerongen, located at Seattle, Wash., will contact the automotive manufacturers in the Pacific Northwest. Mr. Rainey has been with the company since 1927 and had been located at St. Louis, Seattle, Portland, Ore., Salt Lake City and San Francisco previous to his present assignment. Mr. Bolton's service dates to 1929 as a truck tire representative in St. Louis and Chicago. Mr. van Amerongen, following field contact work in Los Angeles in 1941, was on a sales engineering assignment with the Fuel Tank Lining Division in Seattle and later with the Aviation Products Division.

E. T. Rainey

Link-Belt Co., Chicago, Ill., announces that George P. Torrence has rejoined the company as executive vice-president, and will become president November 1, 1946, at which time William C. Carter retires as president. An executive committee consisting of directors Howard Coonley, Russell Livermore and W. C. Carter, was created, with Mr. Carter as chairman.

Cleveland Crane & Engineering Co., Wickliffe, Ohio, has elected Herbert T. Florence as president and general manager. A. C. Garnett, formerly secretary and treasurer, has been named vice-president and treasurer; W. G. Wehr, secretary; and W. D. Vanderbilt, assistant secretary.

Coaltoter Conveyor Co., Chicago, Ill., has changed its name to Material Movement Industries.



ROCK PRODUCTS'

CONCRETE PRODUCTS

and Cement Products

JULY
1946

• Looking down at Hart Concrete Products Co. plant, Tampa, Florida

Super VIBRATOR CONCRETE BLOCK MACHINE

CAPACITY 300 BLOCKS PER HOUR

- Built-to-endure concrete blocks are the GEORGE SUPER VIBRATOR CONCRETE BLOCK MACHINE solution to today's production problems.

- The builder, the contractor, the home owner—all acclaim the GEORGE SUPER VIBRATOR Machine for its ease of operation and its smooth, efficient production facilities.

- Capacity production of 300 BLOCKS PER HOUR maintains perfection in the finished block.

- Simplicity of design guarantees LOW COST PRODUCTION. Sturdy, rugged, skillfully engineered design assures LOW COST MAINTENANCE.

- SUPER VIBRATION — an exclusive GEORGE feature—permits use of a wetter mix than other machines can use; the result is a dense, uniform surface and WATERPROOF blocks.

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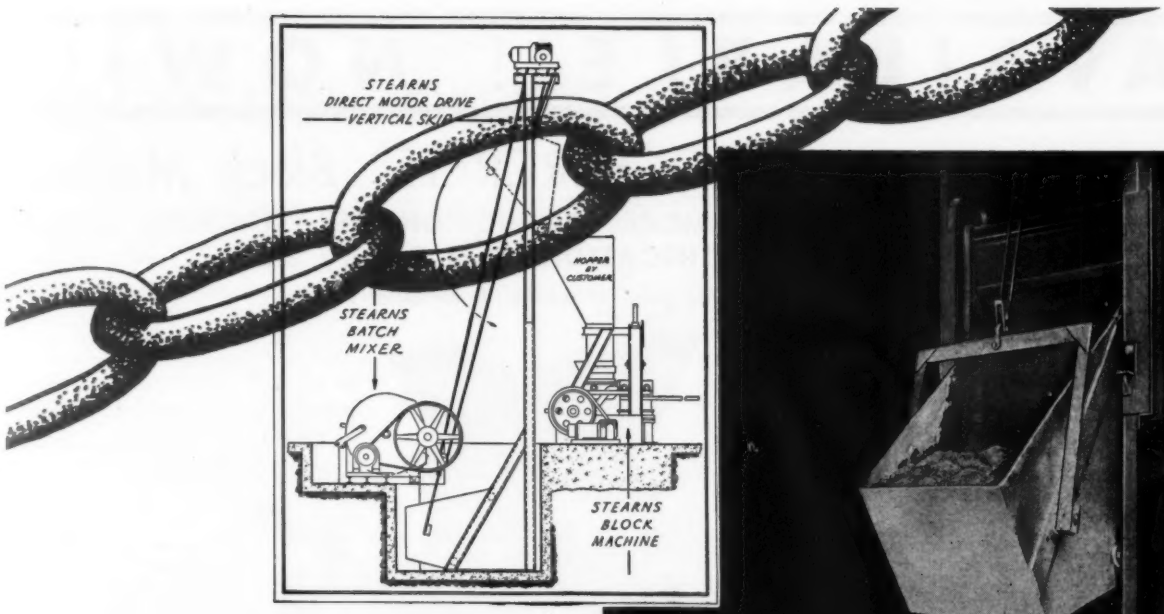

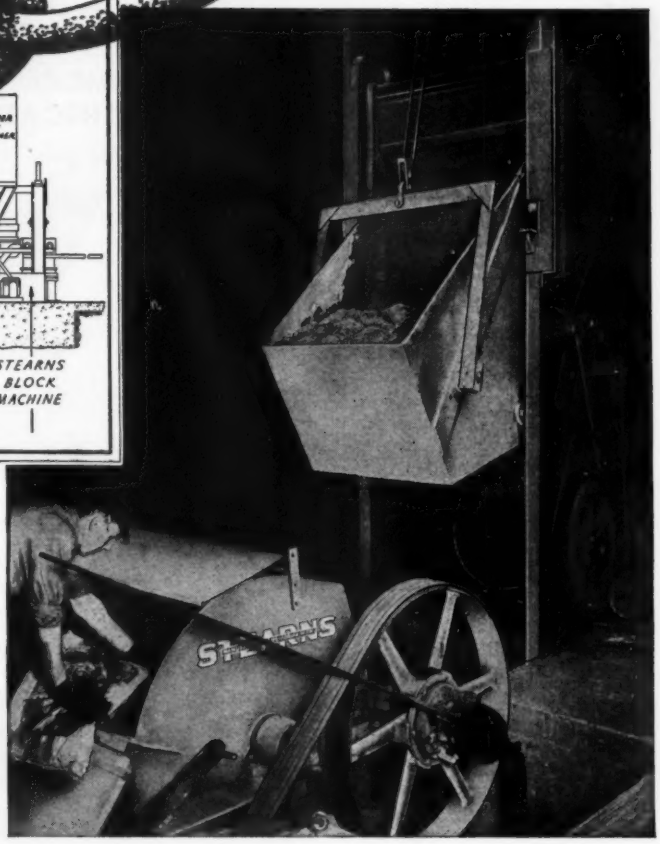

A LINK IN YOUR CHAIN OF PRODUCTION...

STEARNS SKIP LOADERS

—form the most efficient method for conveying concrete from mixers to block machines

Reduce cost by further mechanizing your production. The fully mechanized Skip Loader has proved a practical labor saving device indispensable in hundreds of concrete products plants. It is not one of these impractical complicated mechanisms that tend to prove costly in the long run.

It may be used in many ways. One method is illustrated above, where the Skip Loader carries the mixed concrete from mixer to block machine, both installed on the same floor.

Push button control starts the loaded bucket up and it automatically dumps its contents into the feed hopper over the block machine.

The Skip Loader is also successfully being used to hoist dry materials to elevated mixers or storage bins.

Whatever your plant layout, or the type of machinery now in use, consult us and let us show you how to put this useful device to work.

Performance
Speaks Louder than Words
(ASK ANY STEARNS OWNER)
A Few of Hundreds:

CHASE BUILDING PRODUCTS
Fort Worth and Dallas, Texas
Eight Skip Loaders

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Two Skip Loaders

BENSON-PHILLIPS CO.
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One Skip Loader

For sizes available and various methods of installation, write for a copy of our Skip Loader bulletin.

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Designers and manufacturers of vibration and tamping-type block machines • Mixers • Skip Loaders • Yardhoists

AVAILABLE!! NOW!!

The New Improved "ROCKERCRETE" *Block Machine*

"PLEASE YOUR BANKER"—MORE PRODUCTION PER MACHINE DOLLAR
"NOT A TOY": MAKE SPECIFICATION, Even Density Blocks.

Most Ingeniously Designed Machine in Medium Field

MANUFACTURED
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COMPANY, ATLANTA, GA.
UNDER ROY DARDEN PATENTS

PERFECT OPERATOR CONTROL
NO UNWIELDY LEVERS
NO HEAVY PHYSICAL EXERTION

THIS IS A LEVELING-*HEAD*
NOT A STRIKE OFF

CUSHIONED STROKE
AIR CYLINDER . . .
TROUBLE FREE
OPERATION

MINIMUM FLOOR
SPACE OCCUPIED
IN PROPORTION
TO PRODUCTION

MOLD BOX AVAILABLE
FOR NEW "MODULAR"
SIZE, REPLACEABLE
CORES & LINERS

RUGGED MACHINE
FRAME CONSTRUCTION
MADE TO *LAST*

THREE TO SIX TOP QUALITY BLOCK
PER MINUTE DEPENDING ON OPERATOR

THIS IS A *HEAVY VIBRATOR*
ENGINEERED ECCENTRICITY

[OTHER EQUIPMENT AVAILABLE FOR COMPLETE PLANTS]

- **STEEL AGGREGATE BINS**
- **FEED HOPPERS**
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PRECISION CONTROL

In Concrete Products Manufacture

ONE of the difficulties of the concrete products industry is control of the water content of concrete used to manufacture blocks and other products. Concrete for this purpose must be controlled to much closer limits than that used in other construction work.

Variation in water content affects strength, surface texture, shape and general appearance. If the mixture is too dry the concrete will not hold together and the blocks crumble as they come from the machine. If too wet the block will sag and will not have square edges or straight sides which are very important if a structure is to have a pleasing appearance.

Hart Concrete Products Co., Tampa, Fla. has solved these problems by installing the Scientific Concrete Service Corporation's method of control, and reports that it has found it very satisfactory. It is the first concrete product manufacturer to use this equipment and service.

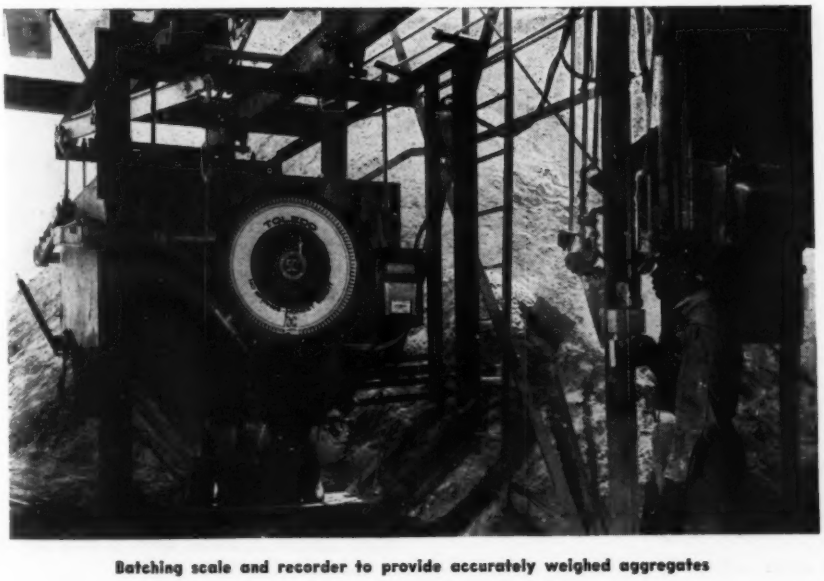
This company entered the concrete products field in 1945. The management realizes that to make superior blocks, the uniformity of the concrete must be rigidly controlled, and it is their object to produce blocks that, when used in building construction, will not require painting or stuccoing.

Batching accuracy is obtained by the use of a precision concrete control installation consisting of two units. The first of these is a specially built Toledo scale which enables the operator to test aggregate for water content in about one minute and get the result to the nearest ¼ percent. Samples for testing are taken from materials going into the weigh-hopper. By this means the operator can make continual tests and pick up variations in water contents as they occur.

Automatic Compensation for Aggregate Water Content

The other unit is a specially built Toledo hopper-scale equipped to compensate automatically for varying water content of aggregates. This is done by the use of aggregate poises with hangers to which disks, calibrated in percentage of poise weight, are added to increase the delivered aggregate weight by the percentage of surface water that it carries. This enables the operator to deliver the correct dry weight of each aggregate in every batch.

Water is delivered to a tank attached to the weigh hopper. The water poise is set for the desired total weight of water, and by removing the disks from the aggregate poises the amount of water already in the aggregates is automatically subtracted. All of this enables the operator to control the desired weight of each ingredient within close tolerances. Cement is added at the mixer, in bags, but arrangements are now being made to use bulk cement.



Batching scale and recorder to provide accurately weighed aggregates

Loading of all ingredients is automatic, started by push-button and stopped by the scale. The aggregate loading gates are operated by electrically controlled air-rams and water is delivered by an electrically operated valve. For all ingredients, adjustments are provided to take care of the material that is in process of dropping when the cutoff operates so the final delivered quantities are controlled to close tolerances.

The Scientific Concrete control equipment also includes a graphic recorder which makes an automatic record of the delivered weight of each ingredient in every batch. By revealing all errors this helps to insure the high quality that it is the purpose of the Hart company to produce. When the batch is completed the weigh-hopper, which is mounted on an angle frame suspended from an overhead track, is moved to the mixer and discharged.

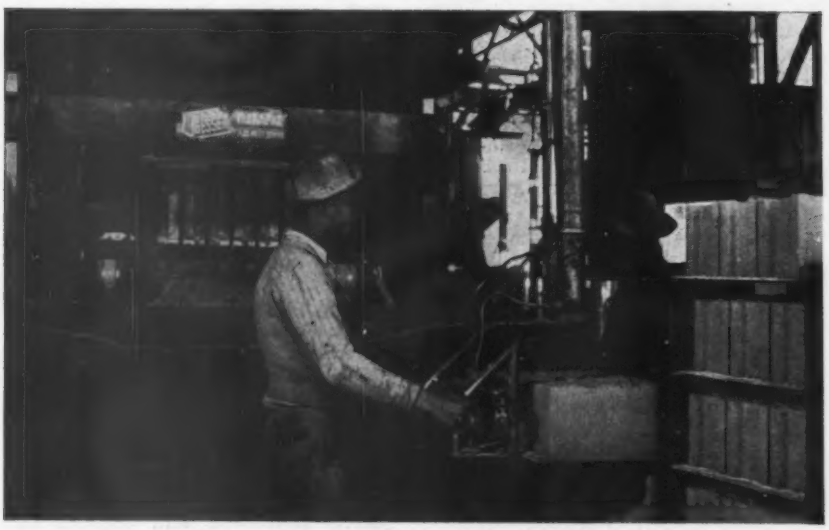
The mixer is a paddle-type Besser mixer that is mounted below floor level to make the complete plant as low as possible. When the concrete is thoroughly mixed it is discharged into a skip which travels up an inclined track and automatically dumps the concrete into the receiving hopper that feeds the block machine by gravity. This is a Besser Vibrapac machine which makes three 8-x 8-x 16-in. blocks, or the equivalent of other sizes, three at a time. It is completely automatic and requires but one man who operates the power off-bearing hoist.

The off-bearer places blocks in a rack that holds 60 standard units. When the rack is filled a power lift-truck removes the rack to a steam curing room. When curing room is filled it is closed and steam is applied immediately. Block remain in the curing room for at least 18 hours. When blocks are removed they are ready for early delivery to the job.

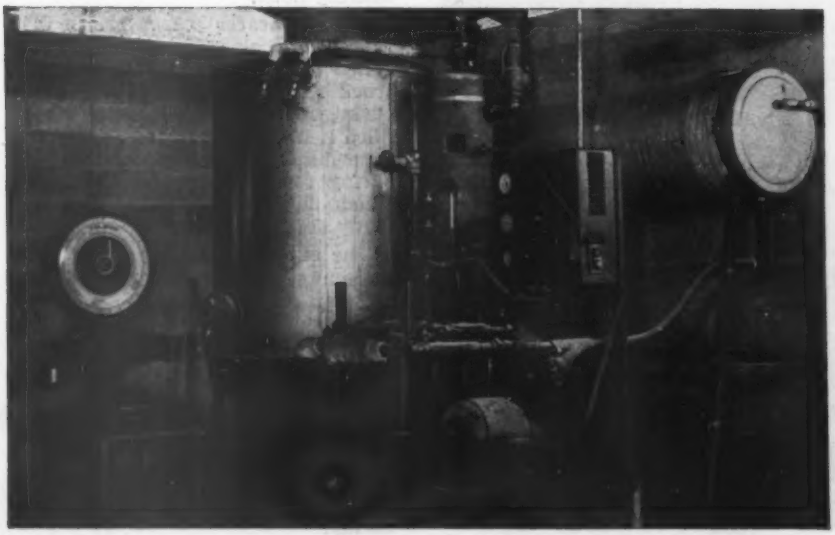
The curing rooms are constructed of concrete blocks with precast concrete joists and precast concrete roof slabs, all made at the Hart plant. There are steam coils and steam pipes with sprinkler outlets on each side of the room. One sprinkler outlet is at the top and the other at the bottom of the opposite side to provide circulation and keep the blocks moist during the whole period of curing.

The capacity of this plant is 9000

Mixer and skip taking concrete to receiving hopper for block machine



Block machine with offbearer placing block in rack



Oil-steam generator for production of steam for the curing rooms. Note moisture recorder (left)

blocks per day, using two shifts. Curing capacity is sufficient for this production.

Other features of this plant are the various means of making blocks to accomodate steel sash, lintel blocks, half corner blocks, pitch blocks for gables, etc. Special blocks are made with a stone cutting saw. Blocks are also scored to give the effect of smaller sizes or ashlar pattern. This saves much mason time on the job as the mason has to handle only one size block. The cutting of half blocks and various other blocks is also a boon to the mason because he cannot get square edges by chipping ordinary blocks. Cutting and scoring save time at the plant because it is not necessary to make frequent mould changes.

Future Plans

At present the Hart company is working on plans to improve the present setup and increase production. A Besser block machine has been ordered, and arrangements are being made to handle all materials by conveyor, from cars to storage bins, and from there to the block plant. Cement will be handled by a Fuller-Kinyon pump. A ready-mix concrete plant is also under consideration.

In addition to the manufacture of concrete block, the company makes joists, floor slabs and tile in different colors, a patented reinforced window frame, street markers, fence posts and other concrete products. Everything will be as nearly automatic as possible.

J. L. HART, owner of the Hart Concrete Products Co., believes thoroughly in the production of high quality products. On this subject he made the following statement:

"Every effort is being made by our company to manufacture a superior product because we believe that when the present day building boom is over and building returns to normalcy, or near normalcy, unless the American people are thoroughly sold on concrete block homes and buildings, our industry and business will suffer."

To Make Ready Mix

ROCKS SAND AND GRAVEL CO., Grand Rapids, Mich., has been organized by Gerald J. Rocks of Grand Rapids and J. W. Hobeck of Holland, Mich., as co-partners. Mr. Rocks was for 21 years associated with the Grand Rapids Gravel Co., as secretary and sales manager. He recently spent three months studying operations of the Henry J. Kaiser Company on the West Coast. Mr. Hobeck for 25 years has been a road construction contractor. The new company will be capitalized at about $100,000 to produce and sell sand and gravel and ready mixed concrete.

Making Concrete Masonry EARTHQUAKE Resistant

By SAMUEL HOBBS*

Tests of reinforced concrete masonry by P.C.A. in cooperation with Pacific Coast builders and producers of block show effectiveness of reinforcing

SINCE the Long Beach earthquake of 1933, building regulations in areas of earthquake hazard such as California have emphasized requirements for structural design to resist lateral forces. These regulations have resulted in general in requiring the reinforcing of masonry walls as determined by careful structural analysis. In the case of masonry of hollow units, it has been particularly difficult to arrive at design practices which are satisfactory and workable.

The test program reported here was planned to provide specific information to clear up some of the uncertainties which surrounded the use of concrete masonry and the regulations that governed its design. There was a definite opinion in the industry that restrictive regulations affecting hollow unit construction were unduly severe as applied to concrete masonry.

The basis for this opinion was that hollow concrete units had a distinct advantage in providing for the reinforcement of masonry walls, because of the facility with which continuous sections of adequate size could be built into a wall structure, thus providing structural members having steel reinforcement thoroughly encased and fully effective, and permitting rational analysis. It was felt that such reinforced members would perform as reinforced concrete members and that the principles of reinforced concrete theory could be properly applied to their design.

*Portland Cement Assn., Los Angeles, Calif.

P.C.A. Organizes Test Program

The Los Angeles District Office of the Portland Cement Association, with the approval of the Research Committee of the Pacific Coast Building Officials' Conference, organized a test program designed to establish the essential facts concerning the actual strengths of wall assemblies of concrete masonry containing reinforced core sections, as a means of correlating construction and design practices with building regulations. The writer was in direct charge of this program, and is therefore familiar with the details of its planning and operation. Many groups and individuals cooperated in the project, which involved a period of discussion and planning, followed by construction, testing and analysis. Members of the Concrete Masonry Manufacturers Association of Southern California took an active part, and assistance was rendered by firms in the construction industry fields of cement, reinforcing steel and aggregate. Building official groups advised, observed and assisted in the work, and several individual engineers and officials rendered valuable aid in the project. The tests were carried out during the summer of 1945.**

The construction and testing were under continuous supervision by Smith Emery Co., testing engineers, who also made material tests and complete records of the test results. The entire project was reviewed and analyzed by Frederick J. Converse, Associate Professor of Civil Engineering, California Institute of Technology, who also advised on testing methods and equipment. His report of the tests to the Pacific Coast Building Officials Conference was published in full in the conference monthly — *Building Standards*, for February, 1946.

It is impossible in a brief article to describe the project in complete detail or to fully interpret the test data. However, an outline may be sufficient to provide the essential information on the methods employed and the results obtained. In order to check actual tests against theoretical design, it was desired to test wall assemblies both in flexure and shear, produced respectively by lateral forces normal to and parallel to the wall. All test specimens were made of the small-size units in common use in the Los Angeles area, of standard stock manufacture, and all other materials were obtained from representative market sources.

Flexural wall specimens were story-height panels built in groups of two different types of units (open-end

Fig. 1: Details of channel course being prepared to receive reinforcing steel. Note expanded metal strip to retain the mortar fill

**Particular credit is due for the help and cooperation contributed by Albyn Mackintosh of Mackintosh and Mackintosh, consulting engineers of Los Angeles, and by Ernst Maag, research engineer of the Department of Building and Safety of Los Angeles County. Mr. Mackintosh assisted materially in the design and operation of the flexure testing equipment. Both he and Mr. Maag, together with J. T. Heisley, representative of Smith Emery Company, played an important part in the control and conduct of the tests.

and closed-end), with three panels in each set of identical design. The normal spacing of vertical members, each containing one ½-in. ϕ bar, was 3 ft., the length of wall panels was normally 6 ft. between end cores, and the normal number of reinforced vertical members was three, placed at ends and center. For comparison one set of three panels had vertical members at the ends only, another set of panels contained two vertical members at the quarter-points of the wall length, and three single panels included an 8-ft. wall with three members at 4 ft., a 4-ft. wall with three members at 2 ft., and a 4-ft. wall with two end members 4 ft. on centers. All of these panels were of 8-in. nominal thickness. To determine the effect of wall thickness on flexural strength, one set of 6-in. bers at 3-ft. intervals.

The panels were tied at top and bottom by horizontal members in a single 4-in. course formed by "channel" units in which two ½-in. ϕ rods were laid and the space filled with mortar or grout. Open cells below the top course were covered by expanded metal to retain the mortar fill. Details of a channel course are shown in Fig. 1.

In order to demonstrate the feasibility of providing for inspection to establish the continuity of vertical cores, cleanout openings were left at the bottom of each core designated to be reinforced and filled. In Fig. 2, an open cleanout may be seen at the bottom of a middle core, while end units have been removed from the bottom course after a few courses were laid up. After checking the cores and filling the cleanout openings, the steel was held in place approximately at the center of the core, while the core was "poured" full from the top with fluid grout, usually in two lifts to allow for settlement. After horizontal steel was placed, the top course was similarly grouted. This form of grouting was employed after experiments determined that a complete fill was thus obtained. An experimental "pier" made of T-sections is shown in Fig. 3, broken open to expose the grout fill. A freshly grouted panel invariably showed a definite pattern of joints darkened by moisture, confined entirely to the unit sections directly enclosing the core, as can be seen in Fig. 4.

Fig. 4: Freshly grouted panel showed a definite pattern of joints darkened by moisture, confined entirely to unit sections directly enclosing core

Testing Apparatus

Testing of these free-standing walls required the design and construction of test frames which could be readily set up, taken down and reassembled. This was worked out in such a manner that support frame and loading frame could be set on opposite sides of a wall panel, triangular cross frames rested on the support frames,

Fig. 3: Experimental pier made of T-sections broken open to expose the grout fill

a jacking timber placed in the apex, and jack and beam gage mounted with blocking to deliver pressure against the loading frame. The frame assembly so provided was in effect a self-contained testing unit capable of delivering measured load normal to the wall panels as they stood in the vertical position. The horizontal support members of the frames rested against the back of the panel at points near the top and bottom; the similar loading members applied load at the quarter points of the opposite face. Uniform distribution was secured by the use of narrow strips of fibre board attached to the bearing surfaces.

Fig. 2: To provide for inspection to establish continuity of vertical cores, cleanout openings were left at the bottom of each core designated to be reinforced and filled. Open cleanout may be seen at the bottom of a middle core

Wall Sustains Ten Times Earthquake Design Requirements

Measurements of load were made by a calibrated beam gage against which the jack load was applied. Deflection at the mid-point of the vertical span was measured by a dial gage attached to a template bearing uniformly at the upper and lower ends of the span. Fig. 5 shows equipment assembled for a flexural test of a wall specimen.

Fig. 5: Equipment assembled for a flexural test of a wall specimen

Examination of the chart shown in Fig. 6 shows clearly the behavior of wall panels under flexural load. It will be seen that the curves indicate a very satisfactory consistency in performance and a steady rate of deflection up to the yield point of the steel. The curves are grouped to furnish comparisons of the load capacities of various assemblies and permit a ready check on the effect of number of vertical beams and on the length and thickness of wall and the spacings of vertical members. In typical 8-in. panels containing three such beams in wall lengths of 6 ft. 9 in., equivalent uniform lateral load was approximately 150 lbs. per square foot at yield, as compared with the usual wind or earthquake design requirement of 15 lbs. per square foot.

In order to provide further data for the analysis of wall panel strength it was deemed desirable to determine the strength and check the design of the individual members contained in such walls. Therefore a series of 12 beams was constructed using 8-in. square hollow units laid up, reinforced and filled in the same manner as the filled section of the wall panels. Three beams were reinforced in the center, three at the top face and three at the lower face of the core as related to the direction of the load. The remaining series of three beams was made with reinforcement at the center and the usual grout

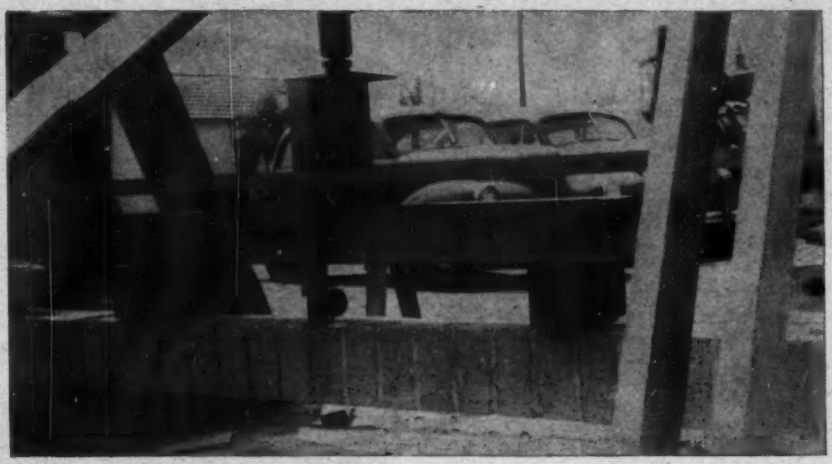


Fig. 7: Reinforced beam placed in horizontal position for testing. Frames used for wall flexure tests were adapted to the testing of the beams

fill, but with a masonry mortar of a weak lime-sand mixture. The beams were placed in a horizontal position for testing and the frames used for wall flexure tests were adapted to the testing of the beams. Fig. 7 shows one of the beams under test with the testing equipment assembled.

The results of the beam tests fully support the expectation that such members in a wall respond to the established principles of reinforced concrete design. The beam curves on the chart in Fig. 6 show clearly the effect on strength of changes in effective depth and of change in the effective section in compression. It is also evident from inspection of the chart that the strength of a wall panel containing two or three beams is more than two or three times, respectively, the strength of a single beam similarly reinforced. This is satisfactorily explained by the anticipated T-beam action and, under the conditions of these tests, the width

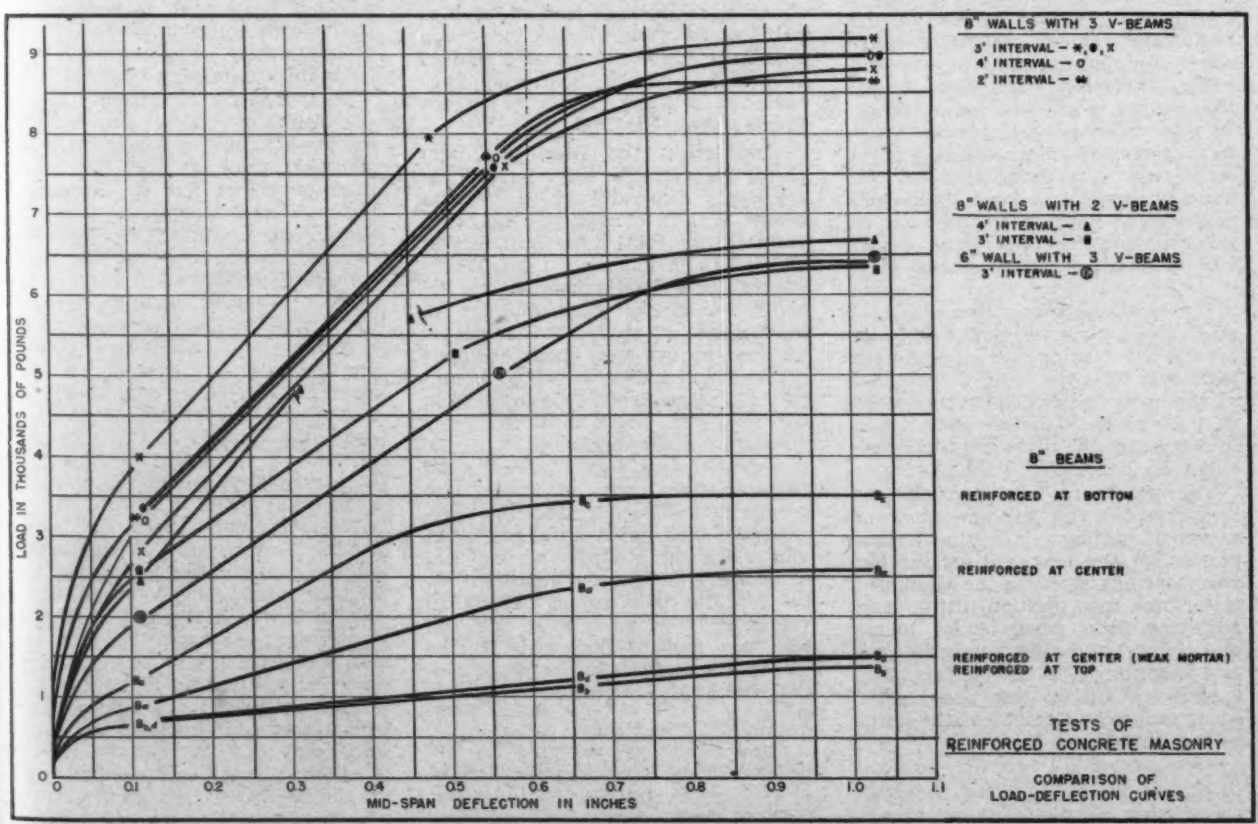


Fig. 6: Beam curves on chart show the effect on strength of changes in effective depth and of change in the effective section in compression

of T-section in effect can be shown to approximate 24 in.

Analysis of typical beams center-reinforced gave stress values at yield load computed on the basis of straight-line theory amounting to approximately 44,500 p.s.i. in the steel and 1,660 p.s.i. in the extreme fibre of the compression section. The steel value agrees closely with the test specimen value of 45,000 p.s.i., and the accompanying compressive stress is within the ultimate strength of the masonry mortar.

The method and equipment employed for making shear tests of wall panels was devised by Professor Converse and proved very satisfactory in use. It was designed to produce the same stress conditions that would occur in the standard "racking" test, in which the load is applied horizontally at a top corner while the panel is firmly held down. In the tests reported here, load was applied horizontally at a bottom corner by operating the hydraulic jack between a wall plate and a reaction block within a yoke. The jack yoke and a vertical yoke slung under the wall corner carrying rollers on which the panel rested had a gusset plate connection to strap members which carried diagonally to the opposite top corner. Another yoke was provided which fitted over a plate set on the chamfered top corner and was bolted to the diagonal straps.

A simple way of adapting the panel construction to this type of testing equipment was worked out. The necessity for space for bottom yoke and rollers indicated some elevation of the panel and an open lower corner. In order to accomplish this, the lower four courses of units were laid up to serve only as a foundation for the panel proper. These courses were laid crosswise to improve the stability of the walls and the corner to be opened had foundation courses of two piers of units with 2-in. spaces between. The top of the foundation was levelled, and a plate was set to lap 4 in. beyond the opening and covered with mortar to form the base of the panel at the open corner. The corner piers were knocked out before testing and in every case the plate remained true and fully bonded.

The procedure used consisted of knocking out the bottom corner of a panel, setting plates in casting plaster for the jack and for the top yoke bearings, skidding the assembled test frame into position, fitting and adjusting jack, gage, blocks, plates and rollers, and then applying load and recording the test results. Fig. 8 shows a typical test panel after shear failure and details of the lower corner assembly.

Nine panels, all of 8-in. nominal thickness, were thus tested in shear. All had top and bottom tie members such as were used in the flexure tests.

Fig. 8: Details of the lower corner assembly of test panel. Note shear failure

Three panels, the "a" group, had vertical reinforcement at the ends only (6 ft. spacing). Three panels, the "b" group, had the same vertical reinforcement but had an added intermediate horizontal member at mid-height. The other three panels, the "c" group, had an intermediate vertical member containing one rod in place of the intermediate horizontal which contained two rods.

The first group described failed in shear at an average load of 4.1 kips per foot of wall. The second group sustained additional average load of 38 percent and the third group carried an average load 20 percent greater than the first.

Considering the first, "a", and third, "c," groups only, having respectively two and three vertical beams in 7 ft. of wall and no other variable, the total horizontal section of beams and face shell masonry resisting shear load amounted to 379 sq. in. for the "a" group and 411 sq. in. for the "c" group. This indicates an average net-area shear strength for the assemblies of 76 p.s.i. and 84 p.s.i., respectively. It is interesting to note the breakdown in shear strength of the beams and of the masonry section which results from simultaneous study of these two groups of test panels, using as variables the shear strength of one beam and the shear strength of one foot of masonry. Solution of equations set up for the two groups results in values of 7.5 kips per beam and 2.24 kips per foot of masonry. This is equivalent to 121 p.s.i. of beam section and 53 p.s.i. of net masonry section.

The range of the test program was too limited to establish the accuracy of such a breakdown of the component shear resistances of wall panels, but the indications thus obtained are interesting in their relative agreement with the values generally assumed as "ultimate" values in design. Similarly, the tests are of too small a scope to fully establish a relationship between the strengths of the "b" and "c" groups based on the two types of intermediate beam which distinguished them from the "a" panels. The results obtained indicate, however, that the intermediate beam had similar strengthening effect, whether horizontal or vertical, and that beams containing two rods had approximately twice as much effect as beams containing one rod.

In attempting to interpret broadly the results of this test program, it is essential to consider together the construction methods and the design practices which, on the evidence of the tests, may be expected to produce the desired uniformity and certainty of results. In outlining the points considered essential to proper correlation of construction and design, one fact should be emphasized because it is fundamental in judging the meaning and value of the tests. The walls and beams tested were not in any way laboratory specimens. They were made, deliberately and intentionally, to represent construction which might be readily obtained in the field. The masonry mortar was cement-lime mortar, considered the lowest strength mortar suitable for earthquake-resistant construction. The grout used had the same proportions as the mortar, except for reduction of the lime content to the amount needed to control segregation. Grouting of the reinforced vertical members was done in a story height operation with no rodding or tamping and full settlement was promoted only by allowing a short interval between two pours in the height of the members. There was no attempt to increase strength by curing, in fact no water was used

after the walls and beams were completed and no rain fell, so that drying out occurred as it would on any job given no attention after its completion. There was no selection of labor to improve workmanship, but bricklayers were used as available and frequently different men laid up parts of the same walls. Care was taken simply to insure that the reinforcement, the core continuity and the filling of cells, corresponded to the design so that the test results could be properly analyzed and evaluated.

Conclusions

The following conclusions can be stated as fully supported by observation of the work and study of the tests:

CONSTRUCTION:

1. Continuity of cores to be reinforced and filled can be readily established by providing clean-out openings.

2. A called inspection prior to closing clean-outs and grouting the vertical members will satisfactorily control placement of reinforcement and continuity of the members in accordance with design.

3. Full bedding of mortar around cores to be filled will effectively enclose the core fill and prevent leakage.

4. Fluid grout poured from the top will satisfactorily fill cores and encase reinforcement.

DESIGN:

5. Members in the form of continuous cores, reinforced and filled, function as reinforced concrete members and may be designed as reinforced concrete. The enclosing cell walls may be included in the section of such members and the compressive area in effect may include an additional T-section beyond the width of the beam.

Fig. 8: Showing a typical test panel after shear failure

The concrete stresses used in design should be determined on the basis of an ultimate strength commensurate with the strength of the masonry units and mortar used. The critical factor in the design of such members is the amount of reinforcement and its location.

* * *

The value of the test program and the effect it may have in rationalizing and simplifying building regulations for lateral force design, can not be determined at this time. It is hoped that study of the report by the Research Committee of the Pacific Coast Building Officials Conference will result in recommendations which will aid in establishing construction and design standards of benefit to the industry and helpful to building officials.

Northwest Pipe and Products Meeting

CONCRETE PIPE AND PRODUCTS ASSOCIATION held its 17th annual meeting on June 15 and 16 at Alderbrook Inn on Hood Canal about 50 miles southwest of Seattle.

The business meeting consisted of Reports of Committees. The Advertising Committee reported each of the issues of the N.C.M.A. Pictorial had been sent to a mailing list of 200 architects, engineers and builders; nine concrete products stories had been sent to a mailing list of 933 engineers, architects, builders, contractors, and state, county and city officials; and one full page advertisement in the Washington County Commissioners Annual, and 3¼ pages in the Pacific Builder and Engineer had been run. The advertising chairman was given a vote of thanks and by motion, authorization was given to increase the advertising budget by approximately 75 percent.

A new member since the last annual meeting was reported by the Membership Committee, the Associated Sand and Gravel Co. of Everett, Wash.

The Legislative Committee reported the organization of a Washington State group which will attempt to pass legislation at the State session next January, requiring payment of Unemployment Compensation to all persons unemployed, including men and women on strike.

Many calls by the individual members and plant visits by various groups were reported by the Contact Committee, including the visit to the Graystone Co., in Seattle, by the Association of County Engineers at the time of their annual meeting in Seattle in May of this year.

Reports were made by C. M. Howard, association engineer, on the following subjects: Proposed establishment of a sheet steel mill in Seattle; the action of the Pacific Northwest Sewage Works Association with regard to the activities of the Amazone Company of Oregon and their proposal to build sewage treatment plants under their new short-cut process.

Attention was called to the recent action of the Washington Department of Highways to use tongue and groove pipe without requiring attached present reinforced collars.

There was considerable discussion by the members on inability to get cement; a committee was appointed to inquire into possible sources of cement for temporary relief.

The annual National Concrete Masonry Association meeting was reported by W. S. Wilson and Fred Kettenring. Mr. Wilson described the layout and operation of several plants which he visited in the Chicago area.

Officers elected for the ensuing year include: President, Fred M. Kettenring, Seattle; vice-president, W. S. Wilson, Olympia; and secretary-treasurer, J. R. Sherman, Yakima.

At the dinner meeting, W. F. Paddock of Seattle gave an outline of the development of the concrete products industry in the Pacific Northwest and complimented Hans Mumm, Jr., on his participation in that development. Mr. Mumm, a veteran in the industry, recently sold his interest in Everett Concrete Products Co., Everett, Wash., and will retire.

New Iowa Block Plant

OTTUMWA CONCRETE BLOCK CO., Ottumwa, Iowa, started production of concrete masonry units in January, 1946. Between 800 to 1000 units per day are produced on a Kirkham vibrator. Present plans include the addition of another machine, and steam curing rooms. Precast specialty items will also be produced in the near future. Noble D. Carroll, president and general manager was released from the Air Corps the latter part of 1945, after serving in early 1944 as an air cadet.

Opens Block Plants

D. C. TALBOT has opened two new block plants, one in Ottumwa and the other in Centerville, Iowa. Both are equipped with a Ford Block Machine Co. tamper, and both plants have an average daily capacity of 650 standard units. The Ottumwa plant has steam curing space for 800 units and will have another curing area of the same capacity soon. Mr. Talbot plans to build a new plant at the outskirts of Ottumwa this winter. The Centerville plant started operations in December, 1945, and the Ottumwa plant opened in April, 1946.

Build Block Plant

GENERAL CONCRETE PRODUCTS, INC., will build a plant in Wichita, Kans.

Members and guests of the National Concrete Burial Vault Association at the 1946 annual convention banquet in St. Louis

Concrete Burial Vault Convention

HOLDING its first annual postwar convention on June 12 to 14, 1946, the National Concrete Burial Vault Association met at the Hotel Statler in St. Louis, Mo., bringing together about 85 percent of the total membership, with members coming from as far as Washington, Oregon and Texas, as well as from Maine and Georgia.

Convention sessions were scheduled to allow sufficient time after each address to permit questions and exchange of information. With no convention held last year, due to governmental ban, the members quickly responded to the invitation to ask questions and each speaker was given a thorough going-over.

An address by George Painter Jr., the retiring president, opened the convention, followed by the report of the secretary-treasurer and reports by the various committees. Sessions were devoted to manufacturing problems, relations with other allied burial industries, technical data, business prospects, consideration of adoption of a commercial trade standard, and other vital subjects. Officers for the coming year were elected and the place for the 1947 annual convention was decided upon. With the emergencies of war over, it was now possible to accept the invitation of Ken Hansford to meet next year north of the border in Toronto, Canada.

New Officers

E. N. Johnson of Pittsburgh, Penn., was elected president to succeed George Painter, Jr., of Philadelphia, who has been president for the past two years. Paul Keating of Springfield, Mass., was elected vice-president and J. R. Van Meter of Cincinnati, O., was re-elected secretary-treasurer. Members elected to the Board of Directors were H. Swingle of Scranton, Penn.; K. Hansford of Toronto, Canada; and W. Hollingsworth of Princeton, Ind.

George Painter, Jr., in his address, warned the industry that it now faces a struggle for existence with the release of critical war materials for other types of vaults. He suggested that the association formulate a definite policy to meet this challenge. Creation of a position of executive-secretary was suggested together with progressive advertising and securing technical advice from some expert for the benefit of the association.

L. A. WAGNER, general superintendent of the Missouri Portland Cement Company, discussed "Some Fundamentals about Portland Cement and Its Use." After outlining the origin and development of portland cement, he discussed some of the main manufacturing processes and problems involved. He also explained the position of the Portland Cement Association in relation to its member companies and also some of the work that association does in the field of concrete. Mr. Wagner organized an inspection trip for the members through the Prospect Hill cement plant of the Missouri Portland Cement Co. Here the major operations involved in making portland cement were inspected and a better concept was obtained of the painstaking methods used in making this product.

M. HARVEY ALEXANDER, of Alexander and Sons, St. Louis, Mo., spoke on "Concrete Vault Sales from the Funeral Directors' Viewpoint." This subject was timely in view of the Association's Code of Ethics, requiring concrete vault manufacturers to sell only to funeral directors or to supply houses. This relationship was thoroughly discussed and strengthened.

WILBERT W. HAASE, of American Vault Works, Forest Park, Ill., led a discussion of a recommended Commercial Standard for Concrete Burial Vaults, TS-4111, as sponsored by the N. C. B. V. A. and prepared by the National Bureau of Standards, Division of Trade Standards. This standard had been circulated among manufacturers, representative cemetery owners, funeral directors, interested associations and allied industries for comment and review. Approval was passed by the convention for a joint meeting with representatives of certain interested associations to again review the standard for final acceptance by the industry.

CASS J. TODT, superintendent of SS. Peter and Paul Cemetery in St. Louis, Mo., addressed the convention on "The Relation between the Cemetery Official and the Concrete Vault Manufacturer." He claimed that cemetery officials actually are the best advertisers of concrete burial vaults, as their interest lies in permanent grave protection and since they advise bereaved families to have such protection.

J. W. BURKE, commercial car and truck manager, Chevrolet Division, General Motors Corporation, advised the group to purchase trucks that have been proved and refined on proving grounds, in order to reduce operating costs. He explained how some of the larger motor corporations are continually checking and improving truck operations by cross checking with trucks of other makes.

S. H. WESTBY, Portland Cement Association, read a paper on "Good Concrete for Burial Vaults." The importance of the water-cement ratio and proper curing for controlling the quality of good concrete was stressed. Some of the manufacturing processes to insure good concrete were discussed, such as mixing, placing, use of vibrators, etc. Elimination of many surface defects were explained by use of one or more of the following:

(1.) Use of mechanical vibrators. If vibrators are now being used and are of the type that permit changing the period of vibration, such a change may be beneficial.

(2.) Light spading of the concrete next to the sides of the mold.

(3.) Changing the type of form oil.

(4.) Changing aggregate ratio by

(Continued on page 128)

BESSER VIBRAPAC BLOCK

To the BEAUTY and PERMANENCE of Besser Vibrapac Block must be added the VERSATILITY of this modern building material. Its many new and distinctive designs can be applied equally well to any type or any size of structure. Vibrapac Block is truly an attractive, all-purpose building material . . . doubly important today because it is so economical for greatly needed small and medium size homes. Besser Vibrapac plants all over the nation are today turning out millions of Vibrapac concrete block, using aggregates obtained from plentiful local sources. Write today for complete Vibrapac Facts!

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BESSER PLAIN PALLET VIBRAPACS

Burial Vault Meeting

(Continued from page 126)

adding more fines to prevent segregation and bleeding.

This was followed by a spirited session of technical questions directed at Mr. Westby on problems relating to the proper uses of cement in manufacturing concrete burial vaults.

J. A. NOONEY, C. P. A. of Boyd, Franz & Nooney, public accountants, spoke on "Accounting—Its Function in Aiding Management." Small concerns as well as large ones were advised to have an accounting of their business to (1) conserve their assets, (2) compile figures for governmental reports, and (3) determine costs of doing business to set selling prices, profits, etc. He cautioned all manufacturers who are not now making an accounting of their business to start at once to compile data for use in any future depression period. Such data may be vital in order to remain in business.

Before adjourning the 1946 convention, President Johnson appointed Paul Keating chairman of the membership committee; F. Van Ess head of public relations; L. Huber as assistant secretary-treasurer; and H. Dahlquist as representative to the Allied Memorial Council.

New Concrete Products Plants

NEW ENTERPRISES for the manufacture of concrete products continue to develop in increasing numbers. News of new and projected plants, according to regions, follows:

Great Plains States

FRANK RITT AND SON, Herreid, S. D., are completing a new plant to produce 2000 concrete block per day. Mr. Ritt has been in the sand and gravel business for 25 years.

C. G. BERWALD sold his concrete block business at Aberdeen, S. D., and will build a new plant on the site of an old baseball park at Mobridge, S. D.

I. L. ANDERSON, Cedar Falls, Iowa, has a permit to build a concrete products plant.

GUY HOTCHKISS AND SON, are building a new concrete products plant near Belleville, Kan.

R. B. ADMUNDSON, JR., Caney, Kan., discharged transport-glider pilot (lieutenant) is building a plant to manufacture concrete block.

CHASE CONSTRUCTION CO., Hazen, N. D., has started production of concrete tile. The company is operated by Ralph Chase and his sons.

DONALD JONES, discharged veteran, has a new plant at Yankton, S. D., to manufacture concrete block.

MARTIN CONCRETE PRODUCTION CO., Coffeyville, Kan., formerly Coffeyville Concrete and Tile Co., has started making culvert tile and, later, will manufacture concrete block and ready-mixed concrete. The plant stopped operations in 1942 due to shortage of labor and materials.

STAR CEMENT BLOCK CO., Sterling, Kan., is a new concern manufacturing concrete block.

PIERRE CEMENT PRODUCTS CO., Pierre, S. D., has been incorporated for $25,000 to manufacture concrete block, tile, brick and other concrete products.

WILLIAM B. DAILY, war veteran, is establishing a concrete products business at Alliance, Nebr.

ASNER-DAVIS CONCRETE PRODUCTS, Kansas City, Kan., is building a "gravity" concrete products plant. Ben Asner, army veteran, and C. P. Davis are owners.

A. H. WALTER has opened a cinder concrete block plant at Scott City, Kans., under the name of the Walter Cinder Block Co.

WITTHAR BLOCK CO., Goodland, Kans., has been started by M. A. Witthar and his brother. M. A. Witthar was formerly with Superior Concrete Co.

Northern States

IDLAND AND JOHNSON, Clarkfield, Minn., are operating a new concrete block and tile plant.

HATTING CONCRETE BLOCK CO., Luverne, Minn., is completing a new concrete block plant designed to manufacture 1200 to 1500 units per day. C. H. Hatting will operate the business separately from the C. N. Hatting Gravel Co.

TONY GRANCITELLI, Monroe, Mich., is planning construction of a plant to manufacture concrete block.

B and B BLOCK CO., Green Bay, Wis., a new concern, has been started by Clyde M. Baccus and James D. Baird, veterans of World War II.

LAMONT CLARK, Ontario, Wis., has started production of concrete block.

SILVERNALE CONCRETE PRODUCTS, Currie, Minn., has a new plant with a McCracken drain tile machine already installed, and is set up to manufacture concrete block in the near future.

REDFIELD CEMENT PRODUCTS CO., Redfield, Minn., has set up a plant to produce concrete block, brick, septic tanks, cesspools, tile, and other products. G. C. Wilson of Minneapolis, Minn., is the owner.

Midwestern States

BESTONE CO., Chardon, Ohio, a subsidiary of Walter C. Best, Inc., producer of industrial sand products, is operating a new $100,000 plant, with capacity of 600 concrete building units per hour, to manufacture concrete products. Other products will be concrete sills, lintels, coping,

floor and roof slabs. Walter C. Best heads the company and W. A. Clark is superintendent of the plant.

HUNTINGTON CONCRETE PRODUCTS, INC., Huntington, Ind., has been organized with P. J. Shultz, Dayton, Ohio, as vice-president in charge of operations and William Pleanitz as superintendent.

CUDAHY CEMENT BLOCK CO., Cudahy, Wis., is constructing a plant at 3645 E. Malory avenue.

SOUTH DIXIE SUPPLY CO., Perrysburg, Ohio, is the name of a new block and building supply manufacturing company recently incorporated by Orlo S. and Willis W. Foster, and Edward N. and James J. Fleitz.

GEILER AND WATKINS, INC., Cincinnati, Ohio, is the name of a new company organized with a capital of $50,000 for the manufacture of concrete brick. William E. Watkins, formerly with Ford Motor Co., is president; Sanford Headley, attorney, is vice-president; and L. R. Geiler, well-known contractor, is secretary-treasurer.

HINDALL SUPPLY CO., Ada, Ohio, has completed construction of a 29-x 70-ft. building to house a new concrete block plant.

RALSTON COAL AND SUPPLY CO., Marion, Ohio, has started to manufacture concrete block.

ALLIANCE CONCRETE PRODUCTS, INC., Alliance, Ohio, has been incorporated to manufacture 12,000 concrete block per day. Incorporators are Lawrence L. Burger, president; Robert Manheim, treasurer and Nathan Manheim, secretary.

MALOWNEY BROS., Springfield, Ohio, is building a concrete block plant in connection with the building of 250 homes to be constructed by the firm this year.

GEILER AND WATKINS, Cincinnati, Ohio, will manufacture concrete block in connection with their contracting business.

JOHN A. PASQUALE, Cleveland, Ohio, has formed the Enduro Co. to make concrete block.

Rocky Mountain States

WALSENBURG CINDER plant, Walsenburg, Colo., has started manufacture of cinder block at the rate of 200 per hour. Louis Marcon, Mario Marcon and Vincent Repola are the proprietors.

S. CARL SMITHWICK, Spokane, Wis., and PAUL P. KLEMENS, Alpena, Mich., have organized a concrete products company, and will erect a new plant at 1750 N.E. Lombard street, Portland, Ore., which will have a capacity of 12,000 8- x 8- x 16-in. units per day.

Pacific Coast

MORTARLESS MASONRY CO., has established a $30,000 plant at East Wenatchee, Wis., and has exclusive patent rights for manufacture of its "interlocking" and "insulated" prod-

uct, of pumice aggregates, in four counties.

HARDROCK BLOCK AND TILE CO., Moses Lake, Wash., operated by C. F. Cass and A. R. Johnson, is the new name of the concern that purchased the Armfield and House concrete block plant.

KERMAN CONCRETE PRODUCTS CO., Kerman, Calif., has been started by Ed Schaffer. The company will manufacture sand and gravel concrete block, pumice concrete block, and roofing tile.

LINQUIST CONCRETE PRODUCTS CO., Brewster, Wash., has been organized by Herb Linquist to make sand and gravel concrete block and pumice concrete block.

PUMICE PRODUCTS CO., Carson City, Nev., has been formed by Mr. and Mrs. Peton R. Walmsley, formerly of Palo Alto, Calif.

Southern States

BUILDERS SUPPLY CO., Bishopville, S.C., has been incorporated to manufacture concrete block and other building materials. Officers are Guy R. O'Kelly, president and secretary; Mrs. Sue O'Kelly, vice-president; and J. L. O'Kelly, treasurer.

MACK'S CONCRETE WORKS, St. Joseph, La., has started the manufacture of concrete block, sewer pipe, culvert pipe, septic tanks, stepping stones, and other concrete specialties.

CONCRETE PRODUCTS CO., Little Rock, Ark., has been organized by Alvin D. Clark as president, Mrs. Maxie C. Clark, and O. Wilkins. The company also will produce sand and gravel and ready mixed concrete. Block manufacturing capacity will be 1000 per hour.

PRECISION BLOCK CO. is building a $70,000 plant in Atlanta, Ga., for the manufacture of a patented, interlocking block. Officers are T. O. Jarvis, Atlanta, president; Isadore Sunshine, Charleston, vice-president; and C. W. Brown, secretary-treasurer.

G. & E. SUPPLY CO., Albemarle, N. C., has started manufacture of concrete block. Oliver H. Gore and P. L. Eudy are the owners.

PORTLAND CEMENT PRODUCTS CO., Rocky Mount, N. C., has started manufacture of concrete block. Owners are Mr. and Mrs. E. C. Derby and their son, Roger C. Derby of Fayetteville. Roger C. Derby will be in charge. The plant equipment will cost $50,000, and will include a Besser Vibrapac.

BRINKLEY CONCRETE CO., Brinkley, Ark., has started constructing a concrete block plant. Concrete tile also will be made as soon as equipment becomes available. Other products planned are burial vaults and floor slabs.

ACME CEMENT PRODUCTS CO., INC., Natchitoches, La., has been organized to produce concrete block and ready-mixed concrete, with an initial outlay of $75,000. Two ready-mixed concrete trucks and a Besser Super Vibrapac block machine are to go into production soon. S. H. Hicks, manager, and Richard deVargas and Dr. W. H. Pierson are stockholders.

East

I. L. STILES AND SON BRICK CO., North Haven, Mass., has built one of the most modern, large capacity concrete products plants in the United States. Chester Carmichael, prominently identified with the industry, is managing the operation.

Ship Block Machine by Plane

IN the accompanying illustration is shown what is believed to be the first shipment of a concrete block machine by plane. The machine, made by Hendry Corporation, Rattlesnake, Fla., was shipped out of Pinellas Master Airport, St. Petersburg, Fla. The weight was 1400 lbs.

Left to right: Ted Kissam, Kissam Building Supply Co., Orlando, Fla.; Frank Blatt, Blatt Sales Co., Inc., Rattlesnake, Fla.; Allen Kissam, designer and inventor of the machine; and Capt. F. M. Hendry, Hendry Corporation

$1,050

EDGAR VIBRA-SHAKER BLOCK & TILE MACHINE

- 14-day shipment
- 2,000 blocks per shift
- Cast aluminum block & tile pallets available
- We also supply mixers, conveyors, water control units and hopper

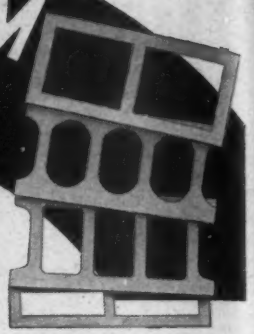
Casts two concrete block or partition tile in one operation with a production up to 2,000 units per day. Husky, built to perform. All moving parts pressure lubricated. The Edgar will be shipped to you within two weeks of receipt of order. Price is $1,050 with partition tile changeover (optional) $100 addition. 20% deposit required.

Write for information.

EDGAR'S BLOCK MACHINE WORKS
ORMOND, FLA.

Agent for mixers and conveyors

ALUMINUM PALLETS



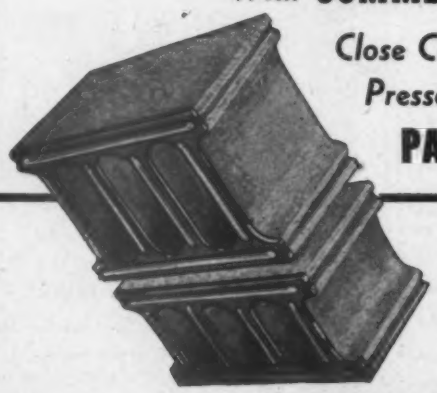
8 REASONS WHY ALUMINUM PALLETS SPEED PRODUCTION

1. Early delivery—many sizes shipped from stock.
2. No bending, warping, rust or corrosion.
3. First cost is usually less than cast iron or steel pallets.
4. Worn and broken pallets returnable at market value of aluminum—about 30% of original cost.
5. Large plants report less than 2% pallet breakage per month.
6. More uniform blocks—less block breakage.
7. Due to short supplies of steel and the slowness of cast iron production, aluminum die casting is the only method that will guarantee early delivery of sizeable quantities of pallets.
8. Light weight means less operator fatigue—low shipping cost.

Mail or express sample or drawing of pallet required for prompt quotation and delivery. We make aluminum, cast iron and brass castings of every description to buyers' specifications.

FLORIDA DIE CASTING FOUNDRY
PHONE 2-1838 • ORLANDO, FLORIDA

Better Blocks—Lower Cost With COMMERCIAL Close Clearance Pressed Steel PALLETS



- ★ Clearance to 1/8 in. of sides of mold box means sharp edges, even with finest aggregates.
- ★ Maximum rack and kiln capacity. Cored pallets designed for each unit made.
- ★ Lighter weight. In normal day's operation, Commercial cored pallets saves 44 tons of moving compared with cast iron pallets—54 tons as compared with solid steel pallets.
- ★ Ribbed, pressed steel for greater accuracy, extra strength.
- ★ Produce mortar groove.

Made in sizes and styles to fit any block machine. Write for details. Complete engineering service available at no cost.

The COMMERCIAL SHEARING & STAMPING COMPANY
YOUNGSTOWN, OHIO.

BLOCK MACHINES FOR IMMEDIATE DELIVERY

We give immediate delivery on the Wooten Concrete Block Machine and mixer

- Block machine price $375 f.o.b. Knoxville
- Capacity: 60 blocks per hour
- Plain pallet press
- Attachments available for several sized block

C. M. WOOTEN CO.
2717 N. CENTRAL AVE. KNOXVILLE, TENN.

ERICKSON POWER LIFT TRUCKS

STAMINA
SPEED
MANEUVERABILITY

Pneumatic tired, low and high lift fork trucks—platform trucks.

No paved runways needed—Speedy hydraulic platform raiser—Simple controls. Write for complete details.

ERICKSON SPECIAL EQUIPMENT MFG. CO.
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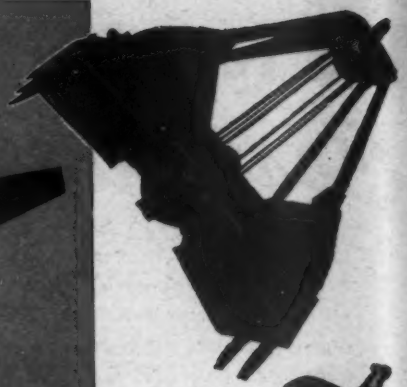
First to feature Welded Steel Construction

WELLMAN

Williams Type BUCKETS



Bucket users know that welded steel construction means longer service at lower cost. Wellman originated this finer type of bucket construction! A type for every service: Multiple Rope, Power Arm, Dragline, Power Wheel, Special Service: ⅜ to 16½ yd. capacity.

SEND FOR BULLETIN

THE WELLMAN ENGINEERING COMPANY
7023 CENTRAL AVENUE • CLEVELAND 4, OHIO

Special "Steep Side" Body | Steel Conveyor "with Belt" Unloading Rock | Model J Side Conveyor or Transfer Attachment | Motor Driven Semi-Trailer Body | Model T Rear Conveyor or Transfer Attachment

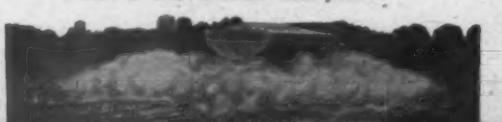
The New Baughman "Self-Unloading" Body is VERSATILE and RUGGED!

Baughman's New Model ASK-2 "Self-Unloading" Body is versatile—spreads lime, dumps rocks, delivers coal into bins, grain into cribs, or transfers its load to another vehicle.

Rugged—one standard body design capable of doing many specialized trucking jobs.

Constructed of high tensile, alloy steel (30% lighter, 17% stronger, and more abrasive resistant than ordinary steel). Ball and roller bearings throughout. Made in either Standard or Steep Sides—Lengths to suit your truck—Power take-off or motor driven—With or without attachments.

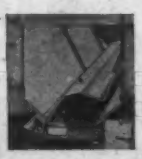
Ask for recommendations—we have a reliable dealer near you.



manufactured exclusively by
BAUGHMAN MANUFACTURING CO., Inc.
Factories - JERSEYVILLE, ILLINOIS

Baughman's All Steel, Standard 11 foot Model ASK-2 "Self-Unloading" Body with Spreader Attached.

Patented and Patents Pending.



Cut-away view of our steel drag-chain with belt attached. Also note new type, adjustable, feed-choker.

View of our Distributor Case. Heavy, hardened and annealed cut steel gears.

View of our heavy cut steel and bronze, 15 to 1, Gear Reduction. Simple, efficient, trouble-free. Will give years of service.

Model O Phosphate and Powdered Lime Spreader Attachment.

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More Ford Trucks in Use Today Than Any Other Make!

Ford

EHRSAM Equipment *first for producing* GYPSUM Wallboard

Many exclusive engineering features plus a complete line of equipment for all phases of gypsum wallboard production make Ehrsam first in the wallboard equipment field.

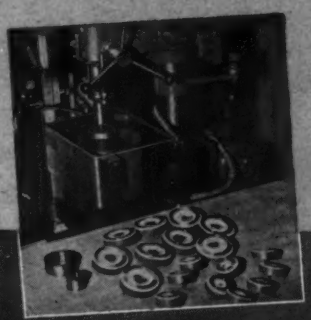
Ehrsam engineers will help you set up a complete plant or iron out production difficulties in your present one. Write for engineering information.

THE J. B. EHRSAM MFG. CO.
ENTERPRISE, KANSAS

AIR PLUS JAEGER COMPRESSOR

Any Jaeger Compressor will hold air above 90 lbs. pressure 20 to 25 minutes (5 to 10 times longer than others)

THAT'S PROOF YOUR TOOLS ARE GETTING ALL THE AIR!



"Ultra-lapping" produces precision finished valve surfaces never before obtained.

You've got to hold air in order to deliver it. Because they're individually "ultra-lapped" (an exclusive process) Jaeger "Tough Swedish Twin" valves have perfect leak-proof closure—5 to 10 times more effective than the best ordinary valves—one of the reasons why "AIR PLUS" compressors deliver more air, more efficiently, at slower piston speeds and the lowest known cost in fuel. Ask for Catalog JC-5. It describes the most advanced line of air compressors in America—sizes 60 to 500 feet.

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Main Office and Factory — Columbus, Ohio

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Write Bucket Headquarters

Whatever the job, Blaw-Knox provides a bucket that gets more work done with less crane time . . . Over 100 types and sizes! Write for Catalog 1757.

BLAW-KNOX DIVISION of Blaw-Knox Company
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The difference in Hammermills may be greater than you think in terms of time and labor saved . . . of greater production at less cost. That's why we urge you to acquaint yourself with the exclusive features of the DIXIE, which has revolutionized the reduction of raw materials in hundreds of plants the world over.

RECORD CAPACITY . . . MAXIMUM PRODUCTION ECONOMY OF OPERATION

are yours when you install a Non-Clog DIXIE with the Movable Breaker Plate. The DIXIE offers *positive feed* even on *wet, clayey, sticky materials*. Quality and size of product may be easily and quickly adjusted. DIXIES increase production . . . decrease need for labor.

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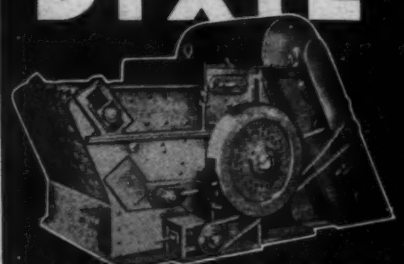

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1—80 ton Baldwin 0-6-0 separate tender switcher, built 1925. A.S.M.E. boiler, piston valves, Walschaerts valve gear, overhauled and up to date on all I.C.C. requirements.

1—20 ton Whitcomb diesel-Mechanical 36" gauge locomotive, four wheel type.

2—20 ton gasoline locomotives, 4 wheel type, built 1941 and 1942, overhauled, standard gauge.

1—25 ton American Diesel Locomotive Crane, built 1942.

1—Williams Clamshell digging bucket, 1 yd. capacity, heavy duty type with teeth, practically new condition.

Birmingham Rail & Locomotive Co.
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RECONDITIONED
USED WIRE ROPE

- All Sizes from ⅜" to 1¼" diameter
- Immediate Delivery (500,000 ft. in stock)
- Continuous Unlimited Supply
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Millions of feet sold to U. S. Govt., contractors, steamship lines, lumber and logging, mining and quarry organizations and to other satisfied users.

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4th & Ferry Streets, LAFAYETTE, INDIANA
Equipment for Sale at Elwood, Ind., April 1, 1946

1—Anchor Spud hoist with 20 HP 2200 volt motor.
1—Swintek 65' dredging ladder. 24 tons.
3—General Electric Co. Transformers 34500 volts to 230-460 volts.
1—15 x 36 Universal Jaw Crusher.
1—9 x 36 Cedar Rapids Jaw Crusher.
1—Model No. 104 Northwest Gasoline crane (Caterpillar).
1—Link-Belt Digging elevator.
1—Smith 42" Rotary screen.
1—Dredge boat spud.
1—Model P.A. 100, 6 cylinder International Gasoline engine 100 H.P.
1—Mechanical cement sack shaker.
2—6" Hetherington and Berner sand pumps.
1—15" Diamond gravel pump base with 250 H.P. G.E. motor.
1—100 H.P. 1800 RPM electric motor.
1—200 H.P. 580 RPM electric motor.
1—300 H.P. 505 RPM electric motor.
Several 40 and 50 H.P. electric motors at various speeds.
1—Marion Model No. 31 steam shovel.

FOR SALE

1—20 ton Locomotive Steam Crane Link-Belt—No. 591, 45 foot Boom, New Boiler Installed Oct., 1944. Complete with 1 yard Rehandling Bucket. Electric Lights. Condition—Good.
Price .....$4500.00 f.o.b. Quarry

BLUE ROCK, INCORPORATED
Box 110 Washington C. H., Ohio

Welders — Hobarts 300 amps with heavy duty Chrysler gasoline engines in first class shape, cable extra, any lengths. Price for machines $490.00 f.o.b. Cable 17c per ft.

JEDCO PRODUCTS COMPANY
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FOR SALE

Dixie No. 2424 Premier Jr. Hammermill Crusher with 40 H.P. Motor 440-60-3. Overhauled in our plant $2000.00 f.o.b. Our Plant.

WYODAK CHEMICAL COMPANY
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CAST ALUMINUM PALLETS

Special Alloy, Lighter, Better, Guaranteed, Standard or Special Designs, Prompt shipment, Reasonable prices.

Write ALUMINUM PRODUCTS, INC.
P. O. Box 1462 Fort Lauderdale, Fla.

FOR SALE

1 Link-Belt Drag Washer with 36 inch bands of steel construction. Good condition, length 22 feet center to center.

DAWES SILICA MINING COMPANY
Thomasville, Ga.

FOR SALE

Electric Hoist, Lambert 80 H.P., 44" dia. drum grooved for ⅞" cable.
Hammermill, K-B 12" x 24". Size 1.
Grinding Mill, 33" Fuller-Lehigh, complete.
Vibrating Screen, 4 deck Kennedy-Van Saun, 4' x 8'.
50 two-way side dump cars, 1½ yard. 24" gauge.

G. & W. H. CORSON, INC.
PLYMOUTH MEETING, PA.

SHOVELS—CRANES

Link-Belt Diesel crane 1¼ yd. with 60' boom.
Link-Belt K48 2½ yd. dragline, new 1935.
Lima 1¼ yd. gas shovel.
Marion 37 shovel, steam,. 1¾ yds.
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Marion Model 450 gas-elec. shovel, 1¼ yds.
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Northwest Model 104, 1¼ yd. crane, boom 70'.
P & H 800-A Diesel dragline-shovel 2½ yds.
P & H Model 650, shovel-crane, 1¼ yd. Rebuilt.
P & H 600 crane, 1 yd. capacity.
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P & H 300A ⅝ yd. shovel-crane.
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Bucyrus-Erie 50B steam shovel, 2 yds.
Monighan 3½ W Diesel dragline, 92 ft. boom.
Osgood 1 yd. shovel-crane.
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Bucyrus-Erie elec. tunnel shovel, 1 yd.
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Gantry crane, 5 ton, 46 ft. span, 15 ft. overhanug.
McMyler 20 ton loco. steam crane.

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Allis-Chalmers HD-10 tractor with angledozer.
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Int. TD 18 tractor with bulldozer.
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Buffalo-Springfield 10 ton 3 wheel road roller new 1941.
2 Dumpster Dumpsters with 20 buckets.
Bucket elevator, vertical, 35', 22" buckets.
Gallon 10-ton, 3 wheel roller.
Kennedy-Van Saun Rotary Screen, 4'x8'.
Drill steel, 1¼", bitted and shanked.
500 drill bits, 1-R and Timken. Various sizes.
Several dredge pumps available from 6" up.
5 Mack trucks, Model LPSW 1942, 11 yd. dump bodies.
3 Euclid Model 1-ZWCL dump trucks.

CONCRETE PLANT AND EQUIPMENT

B-K 250 bbl. bulk cement bin, elec. interlocking.
B-K agg. bin, 110 tons, with weighbatcher.
Smith 1½ yd. tilting mixer 30 hp. electric drive.
3 B-K 5 yd. transit mixers on Macks.
Jaeger, 4 yd. truck mixer on Mack truck.
Rex, 4 yd. truck mixer on Autocar.
Mixer 28S, Smith electric stationary.
Mixer, 56S, Smith tilting skid mounted.
Mixers, two Ransome 42S, elec. Right and left.
Mixer, Koehring 28S, gas, skid mounted.
Mixer, Jaeger 14S, on pneumatic tires.
Fuller Kinyon bulks cement unloader portable.
Koehring 34E dual drum paver.

ASPHALT PLANTS

Standard Plant 3000 lb. cap. Complete, self-contained, including Diesel generating set.
Cedar Rapids Portable 60-80 tons per hour cap.

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Roll, 54x24, 54x20, 48x36, 30x24.
Allis-Chalmers 42" gyratory.
Gyratory crusher: K.V.S. 30, 37-S, 49; 32, 8A, 8B; Traylor 8"; McCully, 13", 8", 6".
Allis-Chalmers 6" fine reduction crusher.
Jaw: 6x12, 9x16, 10x30, 14x24, 12x36, 13x30, 16x32, 24x50.
Complete Rock Crushing, Sand and Gravel Plants.

BUCKET—STONE SKIPS

Blaw-Knox ¼ yd. Clam, digging.
Hayward ⅜ yd. Clam, digging.
⅝ yd. Williams Clamshell, digging.
½ yd. Haiss Clamshell, rehandling.
¾ yd. Haiss Clamshell, rehandling.
10 Battleship 2-3 yd. steel stone skips.
Hayward ¾ yd. Standard Orange Peel.

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Whitcomb 32-ton std. ga. gas locomotive.
Mack 60 ton std. ga. gas locomotive.
Whitcomb 20 ton 36" ga. Diesel loco. Rebuilt.
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3 Western Steel, 20 yd. air dump cars.

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⅜ yd. Insley Shovel. Powered by 40 H.P. diesel unit, complete with starter Dipper 14'. Clearance for loading 18'.

2 yd. Diesel Dragline Page Walker—60' boom. Powered by Model 15 diesel motor.

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"ANYTHING containing IRON or STEEL"

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RUBBER PRODUCTS

Conveyor Belting...Transmission Belting...Elevator Belting...Fire, Water, Air, Steam, Suction or Welding Hose, etc.

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CARLYLE
THE
RUBBER HEADQUARTERS

CARLYLE RUBBER PRODUCTS ARE NEW, GUARANTEED & LOW PRICED

CONVEYOR BELTING

ABRASIVE RESISTANT COVERS

Width	Ply	Top-Bottom	Covers
48"	8	1/8"	1/16"
42"	5	1/8"	1/16"
36"	6	1/8"	1/16"
30"	6	1/8"	1/16"
30"	5	1/8"	1/16"
24"	5	1/8"	1/32"
24"	4	1/8"	1/32"
20"	5	1/8"	1/32"
20"	4	1/8"	1/32"
18"	4	1/8"	1/32"
16"	4	1/8"	1/32"
14"	4	1/16"	1/32"
12"	4	1/16"	1/32"

Inquire For Prices - Mention Size and Lengths

TRANSMISSION BELTING

HEAVY-DUTY FRICTION SURFACE

Width	Ply	Width	Ply	Width	Ply
18"	6	10"	6	6"	5
16"	6	10"	5	5"	5
14"	6	8"	6	4"	5
12"	6	8"	5	4"	4
12"	5	6"	6	3"	4

Inquire For Prices - Mention Size and Lengths

ENDLESS "V" BELTS

"A" WIDTH All Sizes | "D" WIDTH All Sizes
"B" WIDTH All Sizes | "E" WIDTH All Sizes
"C" WIDTH All Sizes | Sold in Matched Sets

Inquire For Prices - Mention Size and Lengths

PROTECT THAT PLANT
FIRE HOSE

APPROVED SPECIFICATION HOSE
EACH LENGTH WITH COUPLINGS ATTACHED

Size	Length	Per Length
2½"	50 feet	$28.00
	25 "	16.00
2"	50 "	23.00
	25 "	13.00
1½"	50 "	20.00
	25 "	11.00

Specify Thread On Couplings

SPECIAL OFFER . . . HEAVY DUTY
RUBBER HOSE

WATER HOSE
Each Length with Couplings Attached

I.D. Size	Length	per Length
¾"	25 feet	$4.25
1"	50 "	8.00
	25 "	6.25
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REDUC. TYPE: Kennedy Nos. 25, 37 & 49. Telsmith 3-F & 49. Traylor 30" TZ, 8", 10", 13". Super. McCully 6"x16". Newhouse 5, 7, & 10". Symons Cone & Disc 7'. 2' to 4'.
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MILLS: Kennedy Ball 4x8, 5x6 & 5x8. Marcy 8x6 & 10x9. Hardinge 6'x3', 8'x20' & 6'x9'. Misc. Tube Mills 5' & 6'x22'. Sturtevant Ring Roll. Raymonds, Kents, Fuller Lehigh, Etc.
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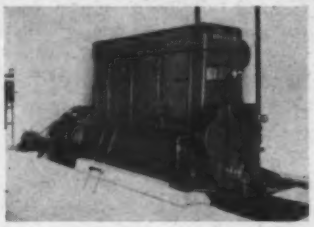

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76 Pillow Block Link Belt Roller Bearings for 2 11/16 Shaft and 1 15/16 Shaft.
180 Self-Aligning Stephens-Adamson Ball-Bearing Pillow Blocks for 2 7/16, 2 11/16, 3 7/16 and 4 15/16 Shafts.
36 brand new Fafnir Self-Aligning Ball-Bearing Pillow Block Bearings for 1 15/16, 2 7/16 and 2 11/16 Shafts.
18" x 39' Portable Conveyor.
225' x 30" Belt Conveyor, with Frame, Speed Reducer and Belting.
148' x 24" Belt Conveyor, with Frame, Speed Reducer and Belting.
61' x 24" Belt Conveyor, with Frame, Speed Reducer and Belting.
83' x 18" Belt Conveyor, with Frame, Speed Reducer and Belting.
54' x 18" Belt Conveyor, with Frame, Speed Reducer and Belting.

We also have the following electric motors for sale:

HP	RPM	PH	Volt	Cy	Make
75	860	3	440	60	Gen. Elec.
75	695	3	440	60	Gen. Elec.
50	860	3	440	60	W.H.
40	860	3	440	60	W.H.
30	750	3	440	60	Gen. Elec.
25	870	3	220	60	West.
20	750	3	440	60	Gen. Elec.
20	1135	3	220	60	C-W
20	1750	3	220	60	Gen. Elec.
15	1745	3	440	60	Gen. Elec.
15	1740	3	440	60	A-C
15	1170	3	220-440	60	L.A.
15	470	3	220-440	60	Century
15	860	3	440	60	W.H.
10	900	3	440	60	U.S.
10	1735	3	440	60	Gen. Elec.
10	1750	3	400		Gen. Elec.
10	1750		400		West.
5	1720	3	440	60	Gen. Elec.
5	1740	3	220-440	60	West.
5	1155	3	220-440	60	Diehl
5	1740	3	220-440	60	West.
3	885	3	220-440	60	W.H.
3	1435	3	220	60	W.E.

Motors above 20 HP have Compensator Starters; 15 and 20 HP have Magnetic Starters.

All the above equipment is located in our yard and may be inspected any time upon advance notice.

FRANK A. KREMSER & SONS, INC.
3435 N. Fifth Street
PHILADELPHIA 40, PA.
Office Phone Regent 9-7272 Night Phone Hancock 4-7959

2—50 ton Porter 6 wheel Locomotives, std. ga. New Nov. and Dec., 1942.
1—70 ton Baldwin Switcher, 6 wheel with tender. Rebuilt.
1—80 ton Lima 0-6-0 Switcher. Built 1944.
1—50 ton g.e. Electric Loco.; 600 volts.
1—50 ton Lima Loco. 0-6-0. Built 1944.
1—16 ton Vulcan Gaso. Locomotive, 36" ga. Rebuilt.
6-7-8 and 20 ton Plymouth Gaso. Locos.
5—18-20 ton Steam Saddle Tank Loco., 36" and 42" ga.
1—14 ton Whitcomb Gaso. Loco., 42" ga.
Lot 2, 3 and 4 yd. Side Dump Cars, 36" ga.
10—18 ton Steel Bot'm Dump Cars, 42" ga.
3—40 ton Flat Cars, 40', std. ga.
4—50 ton Steel Hopper Cars, std. ga.
1—125 ton Fairbanks R.R. Track Scale.
1—30 ton Truck Scale, length 34 ft.
1—15 ton Truck Scale, length 18 ft.
1—No. 5 Gates Gyratory Crusher.
1—Traylor Gyratory Crusher.
1—3 ton Monighan Walking Diesel Dragline.
1—37 Marion Steam Shovel, new oil burning eq.
1—100 Marion Stone Shovel on cats, 5 yd.
1—Marion Electric Dragline, 20 yd. bucket.
2—150 H.P. Loco. type Steam Boilers, 151 lbs.
Shovels, Bulldozers, Mining Machinery.

McCARTNEY MACHINERY CO.
Box 35 S. S. Youngstown, O.

LOCOMOTIVES

1—30 ton Plymouth std. ga. Gasoline Locomotive, 1936.
1—35 ton Plymouth std. ga. Gasoline Locomotive, 1943.
1—45 ton Plymouth std. ga. Diesel Locomotive, 1942.
1—78 ton Baldwin type 0-6-0 side tank Steam Locomotive.

AIR COMPRESSORS

5—500 cu. ft. Ingersoll Rand Portable Diesel Air Compressors, 1944.
1—1240 cu. ft. Ingersoll Rand Elec. Air Compressor 3/60/4000 V or 2300 V, 1942.
1—1995 cu. ft. Ingersoll Rand Elec. Air Compressor 3/60/2200 V, 1942.
1—3092 cu. ft. Chi. Pneumatic Elec. Air Compressor 3/60/2300 V, 1943.
1—3078 cu. ft. Ingersoll Rand Elec. Air Compressor 3/60/2300 V, 1943.

CARS AND CRANES

1—20 yd. Western Air Dump Car—vertical cylinders.
4—50 ton Flat Cars 41' long.
1—25 ton Industrial Brown Hoist, new 1943—oil burner.

B. M. WEISS COMPANY
1601 Girard Trust Co. Building
PHILADELPHIA 2, PA.

SPECIAL OFFERING DIESELS
30 KW International Harvester UD-14 Diesel Engines with direct connected AC Generators.
Above are complete units in every respect. Full details will be furnished upon request.

A. G. SCHOONMAKER COMPANY
50 Church Street New York 7, N. Y.
Phone Worth 2-0455

SCRAPER WAGON AND TRACTOR
Allis-Chalmers Model L Tractor and Garwood scraper, towed type, hydraulic operated, 12 cu. yd. capacity, model 400—4 tires 14:00x20, 2 tires 13:50x20—tires in very good condition.
For complete information and location write to:

JESSE S. MORIE & SON
Morristown, N. J.

FOR SALE
2—Sullivan 7B Shortwall Undercutters.
1—50 HP, 440 volt, A.C.
1—50 HP, 250 volt, D.C.
(BOTH WITH ACCESSORIES)

E. G. KRESS
Certain-teed Products Corp.
120 S. LaSalle St. Chicago 3, Ill.

TANKS FOR SALE
Three tanks 8' dia. by 30'.
One stone tank 100 tons with supporting columns and discharge gate.

G. & W. H. CORSON, INC.
PLYMOUTH MEETING, PA.

FOR SALE

BINS: 1—Blaw-Knox Bin, three compartment, with wood sideboards, 40 tons capacity in each compartment, with three gates, with Johnson batch hopper, with 3 beam scale, water measuring tank and vertical heavy duty bucket elevator on heavy duty, single chain, buckets 20" wide, 18" on chain side, 16" deep. One 12" x 25' flat belt cement conveyor for conveying cement sacks, with 2 H.P. motor, with 20 H.P. heating boiler 15 lbs. pressure. Plant fully enclosed, offered with or without enclosure.

1—NEW 170 cu. yd. cap. water level, all steel, bin, 20' x 20', single compartment, with V bottom, 13'6" clearance from bottom of bin to base of column. NEW.

BATCHER: Blaw Knox, 55 cu. ft. capacity with 3 beam scale.

BOILER: Erie City 150 H.P., self-contained Economic type ASME code, 150 lbs. pressure, complete with all fittings.

BUCKETS: 8—All steel, controllable, self-clearing, drop bottom, concrete buckets.

CARS: 20—All steel Atlas quarry cars, 10 ton capacity, 2-way dump, standard gauge. 2—2½ yd. V-shape, side dump, all steel, Koppel Cars, standard gauge.

COMPRESSOR: NEW Worthington, 210 ft. capacity, on skids, Hercules gas motor with clutch.

DRAG SCRAPER: Sauerman 1 yd. capacity with Crescent drag scraper bucket, 60 H.P. gasoline powered, 2 speed, hoist, all cables, blocks, etc.

GYRATORY CRUSHERS: All sizes and types.

JAW CRUSHERS: Traylor 36 x 42, capacity 6" material 144 tons per hour, 4" material 76 tons per hour, manganese fitted, excellent condition. Also other sizes 10 x 20 to 48 x 60.

REDUCTION CRUSHERS: Traylor 4 ft. and 2'4" type TX, with motor, V-belt drive, etc., complete.

ROLL CRUSHERS: Telsmith 18 x 30 roller bearing, double roll crusher. Allis Chalmers 24 x 54" dia.; 18 x 42" dia.

HAMMER MILL: Dixie Mogul size 5024, hopper opening 40 x 24, with $1000.00 worth of extra new wearing parts.

VIBRATOR FEEDER: Jeffrey Traylor 6' x 6', open pan deck, powered by four No. 5 heavy M-4 motors, including motor generator equipment for 440 volt, 3 phase, 60 cycle, operation; capacity 1500 tons of earth and stone per hour, maximum size stone 3' cubes.

1—48" x 10' with two 58M, 4 power units.

DRY PAN: 9 ft. with 25 H.P. motor and starter, A.C., 440 volt; excellent condition.

KILNS, COOLERS, DRYERS: 1—7'6" x 100' and 1—6'6" x 120', with or without all necessary auxiliary equipment. 1—10' x 90' cooler or dryer.
Also several other sizes.

LOCOMOTIVE—STEAM: 1—Lima 80 ton, 6 wheel, switcher with tender, thoroughly modern, excellent condition. Sale or rent.

LOCOMOTIVE — GAS: 25 ton, standard gauge, air brakes, etc.

SCREENS: Robins heavy duty Scalping Screen, single deck, size 4' x 12', style C-11, with heavy 5½" punched plate screen sections, V-belt drive. Telsmith 4 x 10, triple deck. Jeffrey Traylor 4' x 6'6", single deck, capacity 25 tons per hour, ¼" to 1¼" material.

SHOVELS AND CRANES: Bucyrus Erie 120-B, 5 yd. capacity, 4 yd. manganese rock dipper, Ward Leonard control equipment, 3 phase, 60 cycle, 2200 volt. 1—Bucyrus Erie 50-B Diesel Dragline, 70' boom, capacity 1½ yd. with light plant. 1—Diesel crawler Crane, 98' boom, with 200 H.P. Fairbanks diesel motor, capacity 60,000 lbs. at 25' radius; 12,000 lbs. at 75' radius. 1—Lima 12 ton capacity Crane, 45' boom, powered with 85 H.P., D8800 diesel motor.

PUMPCRETE MACHINE: Model 190 Waukesha 40 H.P. gas motor, sub-hopper, with tools, valves, fittings and 500 ft. pipe; rebuilt.

BELT BUCKET ELEVATOR: Complete, buckets 21" x 12" x 8", length 60'.

A. J. O'NEILL
Lansdowne Theatre Building
LANSDOWNE, PA.
Phila. Phones: Madison 8300—8301

EQUIPMENT WANTED

WANTED

Concrete Block Plants complete or will pay cash for good used concrete machinery and equipment.

AARON MACHINERY CO., INC.
45 Crosby Street
New York 12, N. Y.

WANTED TO BUY
BLOCK MACHINES
Any type or make. Write or phone.
H. R. DOUGLAS
2239 N. 34th St. Milwaukee, Wis.
Kilburn 5335

WANTED

One automatic brick machine for concrete brick.

SAVANNAH BUILDING SUPPLY COMPANY
P. O. Box 1461 Savannah, Ga.

WANTED

7' x 22' or larger Pulverizing Mill.

Write Box D-73, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

WANTED

1—75 H.P. A.C. 220 V, 3 Phase, 60 Cycle, 125 RPM, Gearhead Motor, or its equivalent in a regular heavy duty motor, with suitable gear-reducer. For 2-ton asphalt pugmill.

YORK STONE & SUPPLY COMPANY
Roosevelt Ave. York, Pa.

WANTED TO BUY

Good sand and gravel deposit with or without equipment. Also concrete products plant. Write Box D-83, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FOR SALE

MODERN EQUIPMENT

30 ton Browning 3G Locomotive Crane, new 1943.
25 ton Ohio Steam Locomotive Crane, built 1942.
25 ton Ohio Gas Locomotive Crane.
65 ton Vulcan Diesel-electric Locomotive.
25 ton Whitcomb Gas Locomotive, new 1942.
30 ton American Steel Stiffleg Derrick & Hoist.
13—Western 20 yd. Air Dump Cars. Rebuilt.
9 x 10 Lambert 3 drum Steam Hoist.
315 ft. Ing. Rand Portable Compressors.
475 HP Fairbanks-Morse 8 cyl. Diesel Eng.
120 HP Atlas 6 cyl. Diesel Generator Set.

MISSISSIPPI VALLEY EQUIPMENT CO.
515 Locust St. St. Louis 1, Mo.

WANTED

285 ft. x 24 in. Belt conveyor, complete. Must be in good condition.

CONCRETE SUPPLY CO., INC.
Station B, Box 22
EVANSVILLE 12, INDIANA

WANTED

One new or used hammer mill capacity approximately 50 TPH minus ½" medium hard limestone, preferably Jeffrey make.

DERMOT SHEMWELL & SONS
Albany, Georgia

WANTED

Recent make 5-Roll high side Raymond Mill with motors and controls. Must be located in Eastern U. S. and reasonably priced.

JAMES RIVER HYDRATE & SUPPLY CO., INC.
Buchanan, Va.

WELL DRILL WANTED

Have immediate need for complete Blast-Hole Drill Rig for 6 inch holes. Portable on caterpillar tracks. Prefer diesel, gasoline, or electric drive in that order. Write Box D-81, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

WANTED

Shovel attachment for Model 1201 Lima dragline

Write Box D-74, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

WANTED

Approx. 15 to 20 ton Whirley or Stiff Leg Derrick with 100' boom. 400 C.F.M. 100 lbs. Air Compressor, elec. driven.

AARON MACHINERY CO., INC.
176 LaFayette St. New York, N. Y.

PLANTS FOR SALE

CONCRETE PRODUCTS PLANT for Sale

Going business for sale because owners are in other business. Complete Concrete Block Plant with following: Located on Railroad Siding for three cars; over-head bins with elevator from track into bins. Complete motorized Mixer, Conveyor, and new Gravely Vibrator Block Machine (2000—8" x 8" x 16 Blocks per day). 40 Racks, 1 Barrett-Cravens lift truck. One 35 H. P. Boiler with automatic Water Feed. 3 Drying Kilns with concrete run-ways to yards.
New building suitable for winter operation. Nice Office, complete with furniture and all office equipment. One 1937 Dodge Dump Truck. 1 Day Pulverizer for crushing cinders or shale. Nice cement Storage Room.
This is the most Modern and Complete Block Plant you could have. Located in Middle Tennessee town of 7500. Plenty of orders. No competition in town. Plant can be seen in operation. Price $25,000 Cash. Write Box D-78, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

NEW LIME DUST PLANT

We offer a high capacity complete portable outfit, six months old or less (except shovel). Lease can be assigned. Located northern Illinois. Good reason for selling. Immediate possession. Requires $70,000 investment. Terms can be arranged.

EIGHMY EQUIPMENT COMPANY
526 W. State Street Rockford, Illinois

— PLANTS FOR SALE (Cont'd.) —

For Sale—

SHASTA DAM SAND AND GRAVEL PLANT AND 10-MILE CONVEYOR EQUIPMENT

Including:

6000—36" AND 42" IDLERS.

Pulleys and Drives.

LATE MODEL 200 HP., 1800 R.P.M. GE MOTORS, complete with Starting Equipment.

Western Gear Reducers, 200 HP., 40 to 1 Ratio.

8 x 12 MARCY ROD MILL.

Dorr Hydroseparator.

30" Tripper and Trestle.

Merrick Weightometer.

All Types of Pumps, complete with Drives.

42" Pendulum Boom Conveyors, 100' and 200'.

Electric Line Equipment, Transformers, Motors and Supplies.

Other Miscellaneous Contractors' Equipment.

Subject to Prior Sale

Write, Wire or Telephone Redding 1440

COLUMBIA CONSTRUCTION CO., INC.

Box 579 Redding, California

—ESTIMATING TABLES—

ESTIMATE ANY CONSTRUCTION JOB *RIGHT* WITHOUT FIGURING

SCHAEFER'S NEW 1946 ESTIMATING TABLES contain 225 pages of tables, charts and illustrations covering all types of brick, tile, cinder block, stucco, concrete, cement, plaster and lumber construction. They cut estimating time to a fraction, prevent costly mistakes, soon save their cost many times over. Durable loose-leaf binder. Send for descriptive folder *today!*

SCHAEFER'S ESTIMATING TABLES

229 RAVENWOOD AVE., ROCHESTER 11, N.Y.

—— POSITIONS VACANT ——

WANTED

Superintendent for a new Portable Crushing plant to be operated in Western Pennsylvania. Answer must give details of past employment and other references. Veteran preferred. A year round position with good salary for the right man. Box D-80 c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

OPPORTUNITY OFFERED

Plant Superintendent needed by national cement manufacturer. Permanent position with excellent future. Our own people know of this ad. Outline experience and give salary requirements and references with reply.

Write Box D-75, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

MANAGER WANTED for Concrete Brick plant. Good opportunity for right party. Give complete details about yourself in first letter. Write Box D-76, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

—— MINERAL COLORS ——

MINERAL COLORS
for
BRICK MORTAR
STUCCO — PLASTER

"FINE BECAUSE OF THEIR FINENESS"

Ask for samples and recommendations

BLUE RIDGE TALC CO., INC.
HENRY, VIRGINIA

—CONSULTING ENGINEER—

Quarries
Crushing Plants
Cement Plants
Storage Methods
Operating Costs

E. LEE HEIDENREICH, JR.
Consulting Engineer
67 Second Street, Newburgh, N. Y.
Phone 1828

Operation
Plant Layout
Design
Appraisals
Construction

H. D. RUHM
Consulting Engineer
PHOSPHATE
305 W. Seventh St.
Columbia, Tenn.

W. R. BENDY
312 Times Building
Long Beach, Calif.
Cement Plant Engineering

CORE DRILLING
ANYWHERE
We look into the earth
PENNSYLVANIA
DRILLING COMPANY
Pittsburgh, Pa.

—BUSINESS OPPORTUNITIES—

BUSINESS OPPORTUNITIES

Owner will sell on acct. of advanced age 85 acres of gravel land of first class quality. Located in N.W. Iowa. An open field for an up to date plant of any kind of operation. Full particulars on application. Write Box D-79, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

ASK YOURSELF FRANKLY

"WILL IT PAY TO SELL MY BUSINESS?"

TODAY'S unusual industrial conditions may well justify you in turning your business—FOR CASH—to new management. As a reputable operating organization of long experience, with substantial capital, we can bring opportunity for increased company expansion and greater profit . . . while you are relieved of heavy expense and worry. Personnel held intact whenever possible.

• *ALL discussions and negotiations strictly confidential.*

BOX 1209; 1474 BROADWAY; NEW YORK 18, N. Y.

——POSITIONS WANTED——

CHEMICAL ENGINEER — Sixteen years' diversified inorganic and organic experience—Research direction, administration, patent procedures, sales engineering and service work, technical writing, new product development, and manufacturing research. Fields: building and construction materials; construction methods and practices; portland cement technology, including development and use of admixtures, cement and concrete research, and cement manufacturing; colloid chemistry; industrial waste utilization; and ceramic materials. Capable of independent work, progressive, cooperative, and friendly. Desires position of responsibility and authority on West Coast where presently employed. Will consider sales opportunity. B. S. Ch. E., publications, societies, patents, married, age 40. Write Box D-82, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

POSITION WANTED: By engineer as Superintendent of Operations, with producer of crushed stone. Experienced in quarrying, mining, milling operations, production of asphaltic materials, central concrete mixing plants, and concrete products. Seeking connection where years of training can be used for mutual profit. Can furnish highest references as to character, habits, and ability. Now employed but desire change. Willing to buy part interest in going business. Will go anywhere. Write Box D-67, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

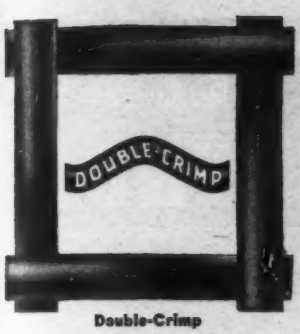
ENGINEER, graduate—desires position as plant superintendent or engineer. 15 years' experience in mining, quarrying, crushing, grinding and processing, and in plant design and construction. Reliable, responsible. Will build an effective organization. Write Box D-77, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

CEMENT CHEMIST—would like position as chief or ass't chief in progressive organization. 19 years' experience in manufacture and use of cement. For details, write Box D-60, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

FORMER ARMY MAJOR with twenty years' experience as chief chemist and assistant chief chemist in modern cement plant desires a position, preferably the west coast. Am willing to go to Mexico or South America, if inducement is satisfactory. Write Box C-95, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

CHEMICAL ENGINEER: After July 1 with varied experience in cement manufacture, wet and dry. Chief Chemist 3 years, Manufacturing & Concrete Research 8 years, Technical Service 3 years. Write Box D-69, c/o Rock Products, 309 W. Jackson Blvd., Chicago 6, Ill.

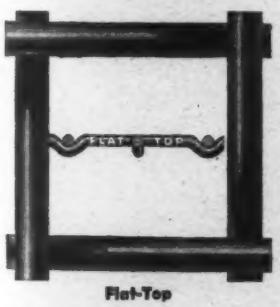
INDEX TO ADVERTISERS



Double-Crimp

Arch-Crimp

Intermediate-Crimp



Flat-Top

"The Perfect"

Wire Cloths and Screens

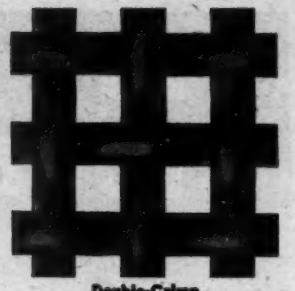
We have been specialists for many years in the making of precision wire cloths, wire screens and woven wire products.

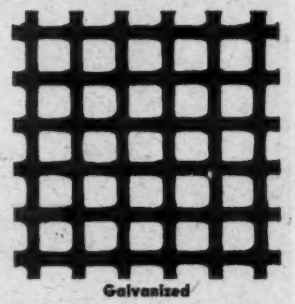
We apply our same precision principles in fabricating wire cloths into finished industrial units, for production or processing equipments or for permanent parts of countless industrial products.

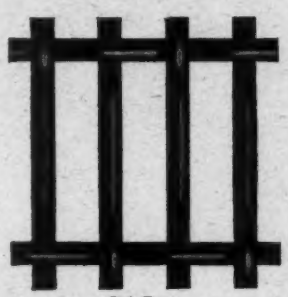
We invite your inquiries for wire cloths of all commercial metals or alloys or weaves, in continuous lengths or cut to size, or processed to meet your individual requirements.

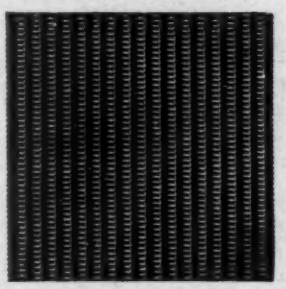
"Perfect" alloys and metals	"Perfect" Wire Cloth weaves	"Perfect" Wire Cloth processing	"Perfect" Wire Cloth products
Super-Loy	Arch-Crimp	Bending	Baskets
Steel	Coiled	Binding	Circles
Galvanized	Double-Crimp	Brazing	Cones
Tinned	Double-Fill	Calendering	Crates
Stainless Steel	Dutch	Clinching	Cylinders
Nickel-Chromium Alloys	Filter	Cutting	Discs
Aluminum	Flat-Top	Dipping	Forms
Brass	Herringbone-Twill	Dishing	Leaves
Bronze	Intermediate-Crimp	Flanging	Lengths
Commercial Phosphor	Rek-Tang	Flattening	Panels
Copper	Selvage-Edge	Forming	Pieces
Monel Metal	Straight-Warp	Framing	Racks
Nickel	Stranded	Galvanizing	Ribbons
Any special alloys available in rod or wire form	Sta-Tru	Painting	Rolls
	Triple-Warp	Shearing	Sections
	Twilled	Slitting	Segments
	Twisted-Fill	Trimming	Spacers
	Twisted-Warp	Arc-Welding	Strips
		Gas-Welding	Template shapes
		Spot-Welding	Trays

We will follow your specifications and blue-prints exactly as your production engineers have prepared them—or we will submit suggestions for your approval.


Double-Crimp


Galvanized

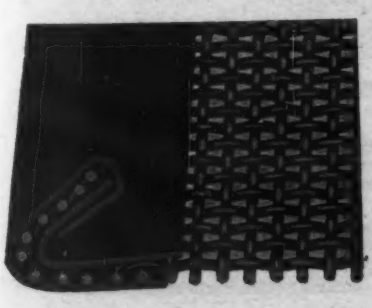

Rek-Tang


Dutch Weave

The LUDLOW-SAYLOR WIRE COMPANY

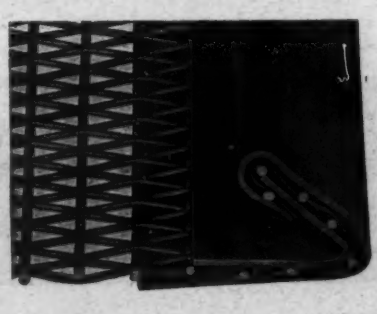
Newstead Avenue & Wabash Railroad

ST. LOUIS 10, MO.



LUDLOW-SAYLOR PRECISION FABRICATING makes vibrating-screen decks and jackets that are easily handled—quickly installed—need fewer adjustments and renewals.

Illustrations suggest only a few of the many available types of wire cloth and woven wire screens, which may be custom-finished with attachments to fit your particular processing installations.



DUST COLLECTION AT LIME HYDRATOR PAYS DIVIDENDS

Pictured here are two Type N Roto-Clone applications typical of many others in lime dust collection service. Results in both instances are outstanding from the standpoints of efficiency in operation and savings of material ordinarily lost in process. The Roto-Clone shown below, serving a Clyde Hydrator, recovers 1½ tons of lime per day, saves roof cleaning and neighborhood complaints. Send for Type N Roto-Clone Bulletin No. 277.

Not only does the Roto-Clone remove all dust from the vented steam and air, but the lime slurry resulting from the cleaning operation is salvaged and piped to the hydrating pan *automatically and continuously*. The Roto-Clone does this remarkable job without cost because the savings not only pay for the current used but will also, in time, "write off" the original cost of the installation.

The Type N Roto-Clone cleans by means of a water curtain induced by the flow of air. There are no moving parts or narrow passages to be obstructed by lime dust deposits. Capacities—1,000 to 25,000 cfm.

AMERICAN AIR FILTER COMPANY, INC.
Incorporated
107 Central Ave., Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

Roto-Clone is a registered trade-mark for a dynamic precipitator or hydrostatic baffle-type wet collector.

ROTO-CLONE
FOR ROCK PRODUCT DUST CONTROL

As free of stress as well-worn moccasins

HAZARD'S LAY-SET *Preformed* WIRE ROPE

You get true flexibility—limberness—willingness to bend—a wire rope that is easy to handle—when you put Hazard LAY-SET Preformed on your machine.

That is because every wire is preformed. It is the preforming process that frees the steel from internal torsional strains and pent-up stresses. It endows the rope with amazing resistance to bending fatigue, makes it spool better on drums, makes it easier to handle—reeve faster. All these characteristics add up to longer life, fewer machine shutdowns for rope replacement, steadier machine production, safer working conditions, greater dollar profit.

For your next line, order Hazard LAY-SET Preformed. Put it on your own machine, keep your own service records. Test it in your own way. Make it prove itself. It will.

ACCO

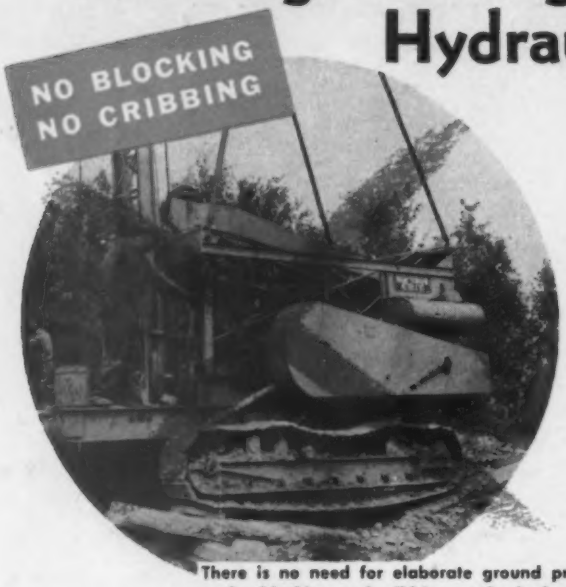
Wilkes-Barre, Pa., Atlanta, Chicago, Denver, Houston, Los Angeles, New York, Philadelphia, Pittsburgh, Portland, San Francisco, Tacoma, Seattle, Bridgeport, Conn.

TRADE MARK

HAZARD WIRE ROPE DIVISION
AMERICAN CHAIN & CABLE

In Business for Your Safety

Owners Report 15% More Drilling Time Through Savings Made with 42-T Hydraulic Jacks



There is no need for elaborate ground preparation or for blocking and cribbing — the hydraulic jacks, extended or retracted to conform to ground surface, provide quick, stable leveling.

Perfect three-point leveling in a minute or two! The time saved greatly increases drilling time, substantially adds to blast hole footage per shift.

BUCYRUS ERIE

42-T

Now Available with Hydraulic Jacks

Conveniently located control valves operate the three jacks — the two shown here and another at the opposite end of the machine.

A new Bucyrus-Erie feature now offered as optional equipment on the 42-T blast hole drill has proved, through field performance, ability to increase blast hole drilling footage as much as 15% per shift. Entirely eliminating blocking, cribbing, and elaborate ground preparation, the jacks produce great savings in time by speedily leveling the drill, often in a matter of seconds. There are three jacks, attached to and operating spuds mounted on the drill frame — two at the drilling end, another at the power unit end. It will pay you to analyze your blast hole drilling — to check into the increased production you can get with a hydraulic-jack-equipped 42-T.

1084-C

BUCYRUS-ERIE CO.

SOUTH MILWAUKEE, WISCONSIN